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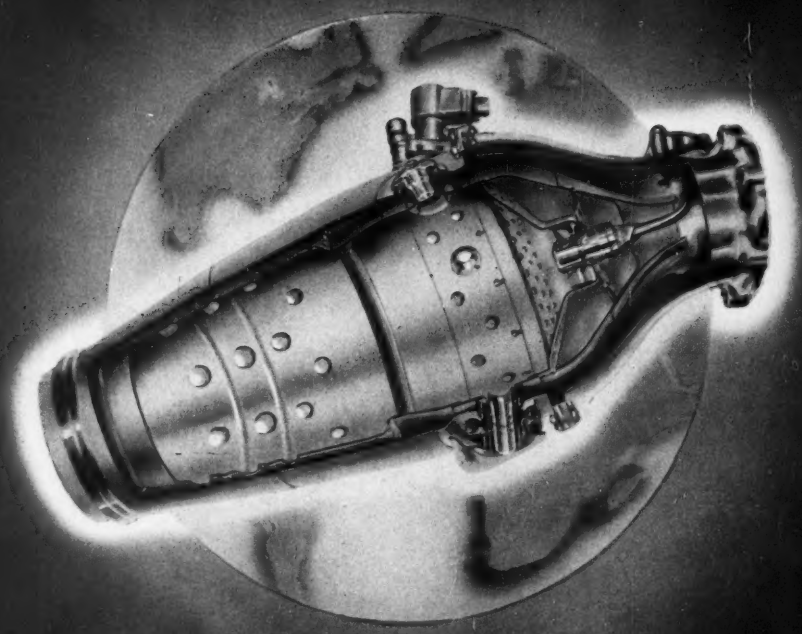

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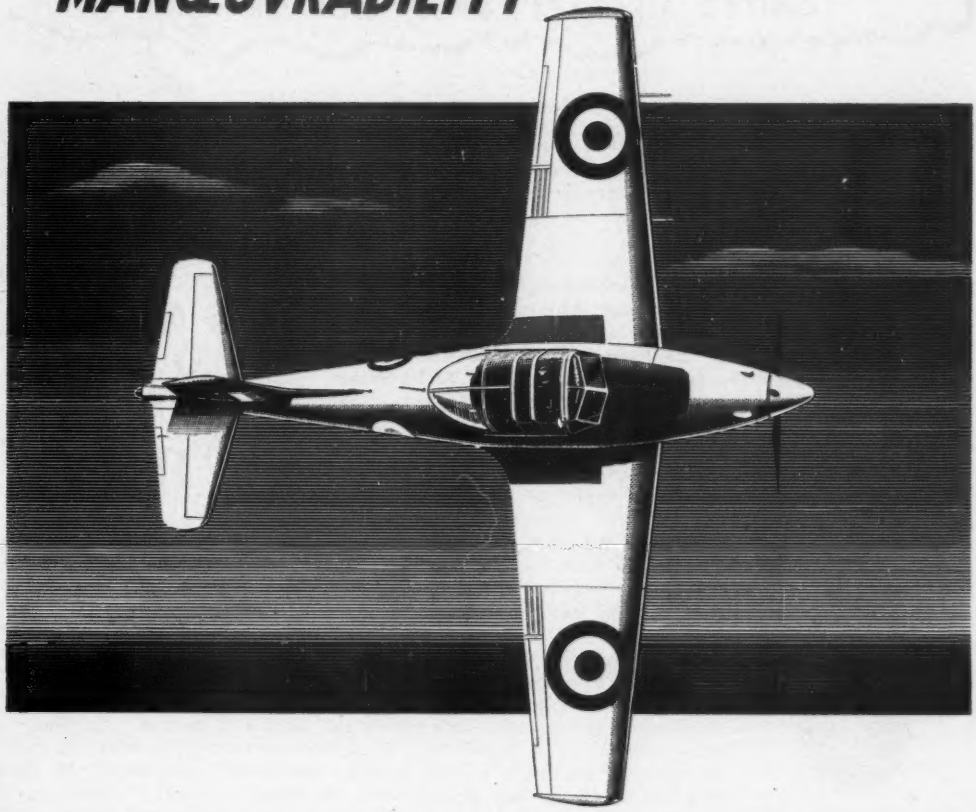

FIGHTER-LIKE MANOEUVRABILITY is no idle claim where the Balliol is concerned At eighty-five per cent of the designed diving speed its rate of roll is 105 degrees per second. and its "feel" and handling qualities are in fact very similar to those of the latest fighters now going into service

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A

UNITED AIRGRAM

UNITED AIRCRAFT EXPORT CORPORATION

Dear Sir:

Because we are interested in the efficiency and success of users of our equipment, we try to keep pace with their requirements for spare parts and major components. In this regard, we sincerely believe our manufacturing divisions have an excellent record, especially when the operators themselves have used enough foresight regarding their needs.

But, the stepped-up military program of this country places upon us a grave responsibility. Military requirements must be met, unfailingly. To this end, we have recently licensed the Ford Motor Company to build Wasp Majors, and Chrysler Corporation, J-48 Turbo Wasps. So far, our military demands have been filled and it has also been possible to keep supplying our domestic commercial and export customers with reasonable dispatch. However, as military demands grow, it is possible that a diversion of some materials might be unavoidable.

It is also becoming more and more difficult for us to obtain materials from our own suppliers and delivery time has increased greatly. For instance, the completion time on orders for new engines going through our Pratt & Whitney plant has increased to fourteen months and may, of necessity, be further increased.

So, we urge our customers to continually study future requirements for spare units and spare parts, so that orders with proper priority ratings can be placed sufficiently in advance to compensate for current and potential delivery delays. In emergency cases, we will do everything we can to supply materials sufficient to keep aircraft flying, but there will surely be more frequent cases of emergency, with consequent greater load upon our capacity. These conditions, together with rapidly increasing cost of labor and materials, should receive your full consideration in planning future orders.

WESTLAND GETS SIKORSKY S-55 LICENSE. Westland Aircraft, Ltd., largest helicopter factory in Europe, recently signed a license agreement under which S-55 Sikorsky helicopters will be built in England. Westland has been building the Sikorsky S-51 since 1947.

Because the S-55 requires an engine power in excess of that provided by the engine at present generally installed in British helicopters, Westland will use the American Pratt & Whitney R-1340 (600 h.p.) and will further explore the possibility of British manufacturers producing an all-British power unit.

The S-55 has 6,800 pounds gross weight -- useful load of 2,405 pounds -- high speed of 110 m.p.h. -- cruising speed of 86 m.p.h. The S-55 is being produced at Bridgeport by Sikorsky for the U.S. Air Force (designation: H-19) and the Navy and Marine Corps (designation: HO4S-1).

WINDMILLS AT WAR -- The Sikorsky Helicopter Meets The Acid Test. In Korea, under the most trying conditions, Sikorsky Helicopters have performed such extraordinary feats in rescue and liaison work that they have attracted world-wide attention. In places where no other form of transport, air or surface, could perform, Sikorsky helicopters have functioned with outstanding reliability and efficiency.

As just one indication of their accomplishments, we repeat excerpts from a leading New York paper:

"Flying windmills have saved no less than 655 critically wounded soldiers from possible death . . . there seems no doubt that this remarkable flying machine is finally coming into its own. The 655th man rescued was so badly injured that he couldn't have been carried for any distance on a litter . . . the helicopter was able to reach an area unattainable by any other device. Helicopters have never, not even in World War II, played such an important part in military operations as they are doing today and men in the field say there is a great need for even more of them. The successful, large-scale helicopter operations in Korea suggest that peacetime uses for the machines may be far greater than generally anticipated."

NEW PURCHASES NOTE:

Trans World Airlines and Eastern Air Lines will shortly receive the first of their new Martin 4-0-4 airliners. TWA will receive a total of forty and Eastern thirty-five. An improved version of the Martin 2-0-2, the new Martin 4-0-4, is reported to combine unusually low landing speed with high cruising speed. TWA's 4-0-4s will be equipped with Pratt & Whitney R-2800-CB16 (two-speed supercharger) engines suitable for high altitudes. Eastern's will be powered by R-2800-CB3 (single-speed supercharger) engines, suitable for its runs. Both will be equipped with Hamilton Standard 43E60 propellers, incorporating feathering and reversing features. New square-tipped duralumin blades bring substantial advances in structural as well as aerodynamic design.

FORD, CHRYSLER TO BUILD PRATT & WHITNEY ENGINES:

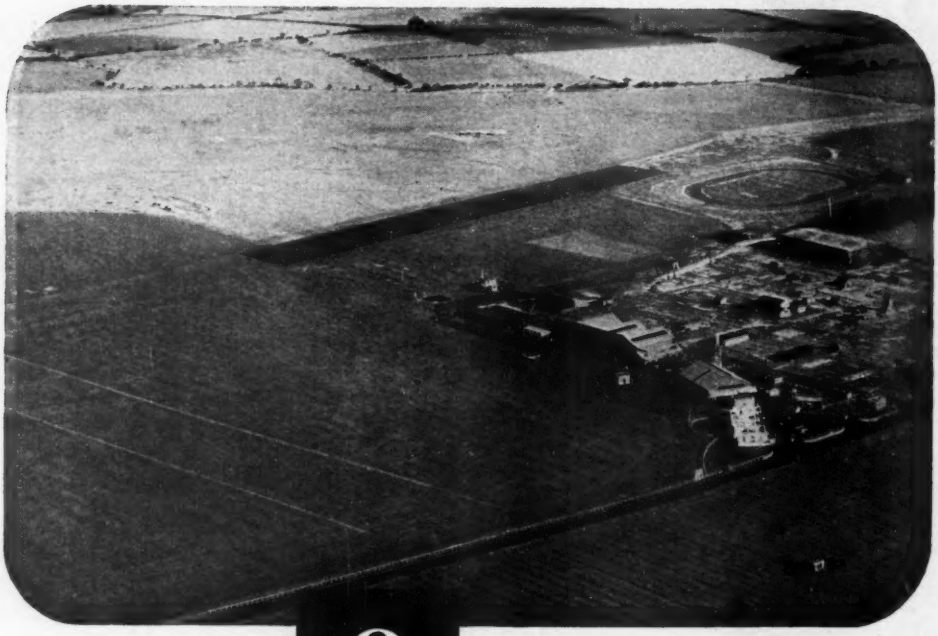
To help meet the rapidly expanding requirements of the Armed Forces, Pratt & Whitney is again licensing automotive manufacturers to build its products. The Ford Motor Company will build the R-4360 Wasp Major engine in a government-owned plant in Chicago, and the Chrysler Corporation will build the J-48 Turbo-Wasp.

IMPORTANT CHANGE-IN-ADDRESS NOTE: European Office, formerly at Rue Montagne Du Parc, 4 Brussels, Belgium, now at: United Aircraft Export Corporation, 3/5 Warwick House Street, London S.W.1, England. Cable: UNITEDAIR LONDON. Inland Telegrams: UNITEDAIR LESQUARE LONDON.

UNITED AIRCRAFT EXPORT CORPORATION
EAST HARTFORD 8, CONNECTICUT, U.S.A

European Office: 3/5 Warwick House Street, London SW1, England.

Do you know your airfields?



8

Recognize this airfield? It's No. 8 in this series of puzzle photographs. You'll find the answer below on the right.★

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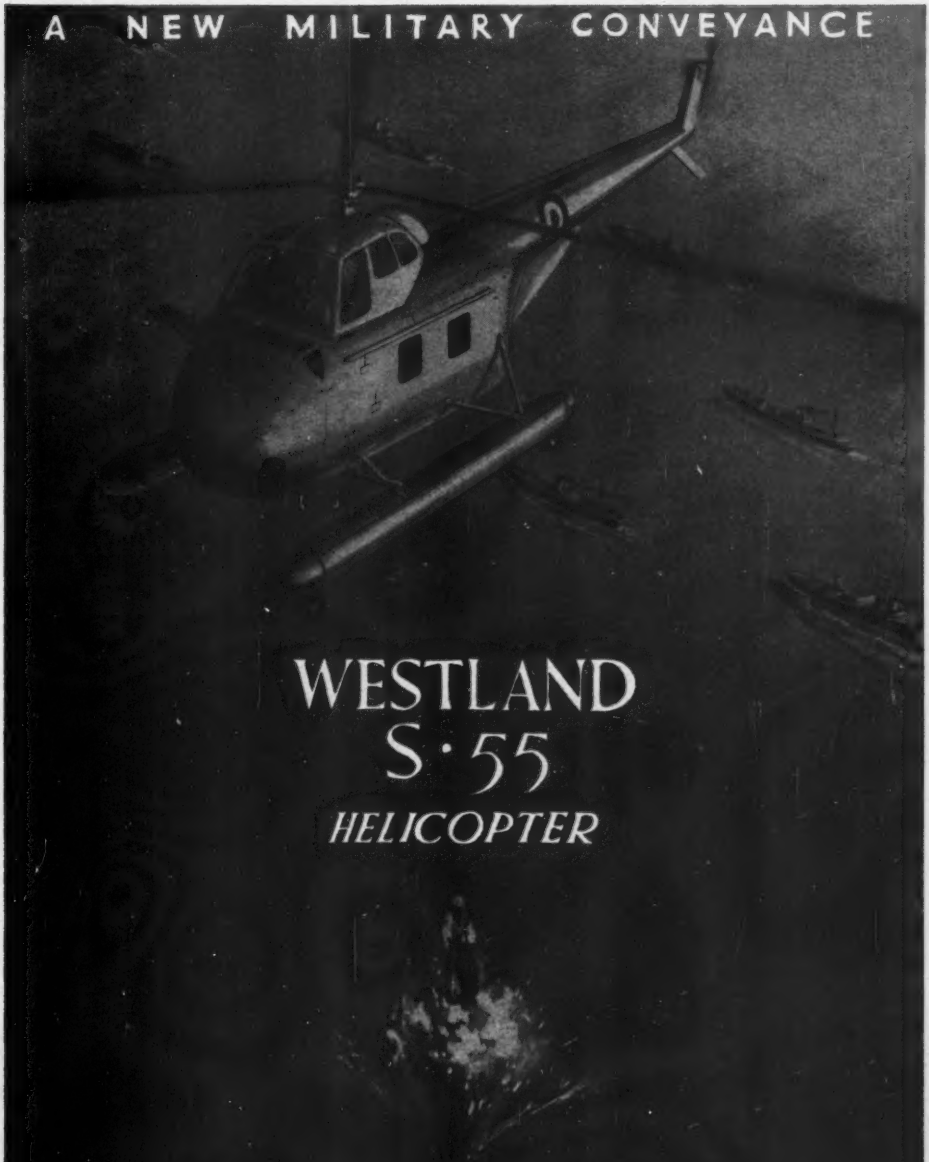

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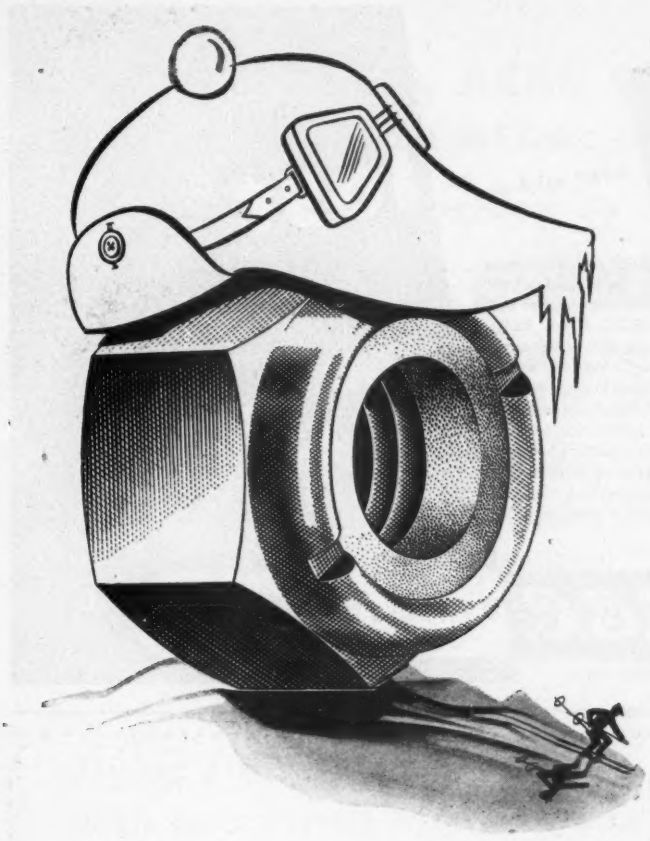

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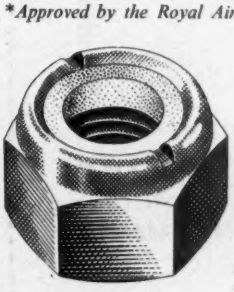

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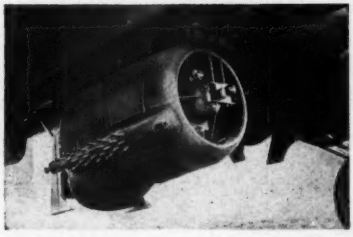

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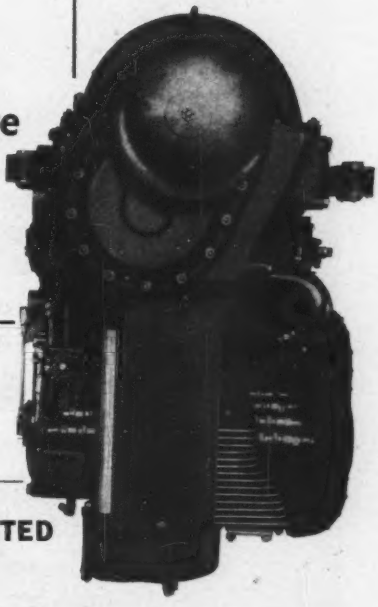

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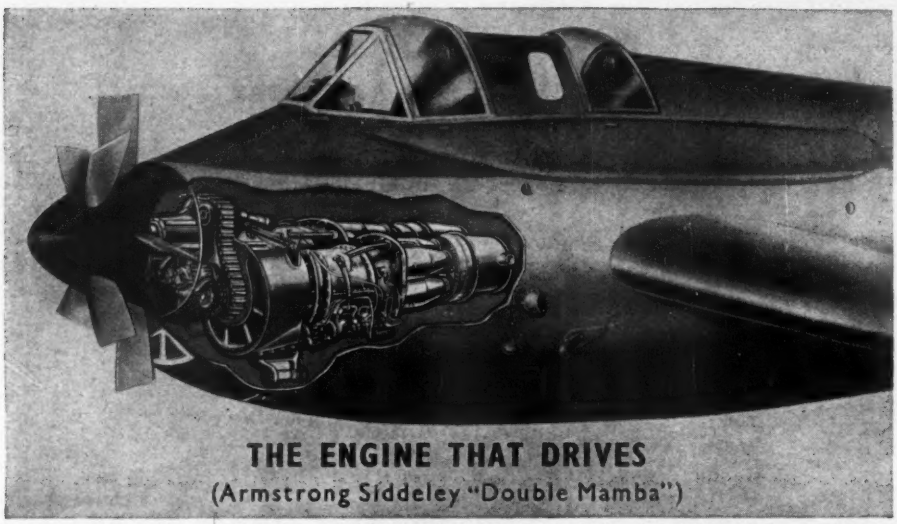

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AIRCRAFT ENGINEER

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Founded 1909

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Airing Civil Aviation

RECENT debates on the Air and Navy Estimates seem to have warmed Members on both sides of the House to aviation matters : last week they debated the various aspects of civil aviation with great vigour. Following an able and comprehensive opening speech delivered by Mr. George Ward, who is chairman of the Conservative Party's Parliamentary Committee for Civil Aviation, much that needed ventilation was brought out, though the facts—pro and con—were frequently buried in a great deal of political verbiage or obscured by dust from many grindstones.

It is true that there was little new in it all, but most Members came well prepared with facts and quotations, and thus the details were assembled to give the most complete picture seen for many months. The debate will be reviewed in our next issue, but certain salient points may be singled out for mention here. The accounts of the two Corporations, for example, once again came in for a good deal of severe criticism. It is right, and to be expected, that the continuing heavy losses which taxpayers must shoulder (in addition to many other much greater and vastly less worthwhile national expenses) should be deprecated, but we feel that more credit might have been given for such progress as there has been during the last year by both B.E.A. and B.O.A.C. We would, also, associate ourselves with the high praise accorded to the efforts of Mr. Peter Masefield, B.E.A.'s chief executive.

On the Corporations' non-scheduled activities we must comment less favourably. However much circuitous argument there may be, and however much justification for actions is claimed on the grounds of increasing the revenue earned by otherwise inoperative aircraft, with no addition to overheads, the whole business appears at best to savour of questionable ethics on the one hand and shabby treatment of the non-scheduled operating companies on the other. This judgment has no political flavour; it is based only on fair and normal business practice.

Certainly it is the duty of the Corporations to turn their deficits into profits by all fair means and as quickly as possible, but patently it would be intolerable if an individual businessman were compelled to contribute towards his business rivals' expenses so that they might undercut him.

Discussions of high landing-charges and low rates for carriage of air mail in this country were indeterminate, as were those on the anomalies of fuel taxation for commercial and private flying. Suggestions were made, however, that further savings ought to be effected by reducing even more the staffs of the Corporations, in particular B.O.A.C. The number of B.O.A.C. employees has already dropped from 23,600 in April, 1948, to 15,600 in January of this year.

Over-staffing at high administrative levels at British airports—an airport manager and an airport commandant appointed by M.C.A. and a station superintendent by the airline—was also mentioned. Although, for a long time past, we have heard objections to the appointment of too-old men and retired Air Force officers to important posts in civil aviation, we feel that in some quarters there has been too great a tendency to generalize from the particular in this matter.

Mr. Geoffrey Lloyd contributed a welcome and informative speech on the subject of Fido, and firmly corrected exaggerated estimates of its operational cost while indicating its undoubted value.

Finally, it must be recorded that a large part of the debate was devoted to aviation in Scotland, and particularly to the subject of Prestwick and its development. Impassioned speeches were made by various members from across the border. Mr. Beswick replied by quoting the large part of the deficit—of the order of £462,000—occasioned by Scottish services. The cost to the public of Prestwick's development and maintenance had already been put at £2,788,000 by Mr. Rankin.

The Bill—Consolidated Fund (No. 2)—was read for the second time. The lively debate gave encouraging evidence of widespread interest in civil aviation and of the considerable specialized knowledge of the many Members who took part. These are healthy signs.

METEOR Mk 8

Newly Released Details of Performance and Tankage: Ground-attack Development

WHEN our first description of the Gloster Meteor 8 appeared in *Flight* of October 6th, 1949, official restrictions prohibited any mention of performance and fuel tankage. These restrictions have now been removed and it can be disclosed that this mark of Meteor has a maximum speed of 516 knots, climbs to 30,000ft in 6·5 min, and has a range, with a tankage of 795 gallons, of 955 nautical miles. Other performance figures are given later.

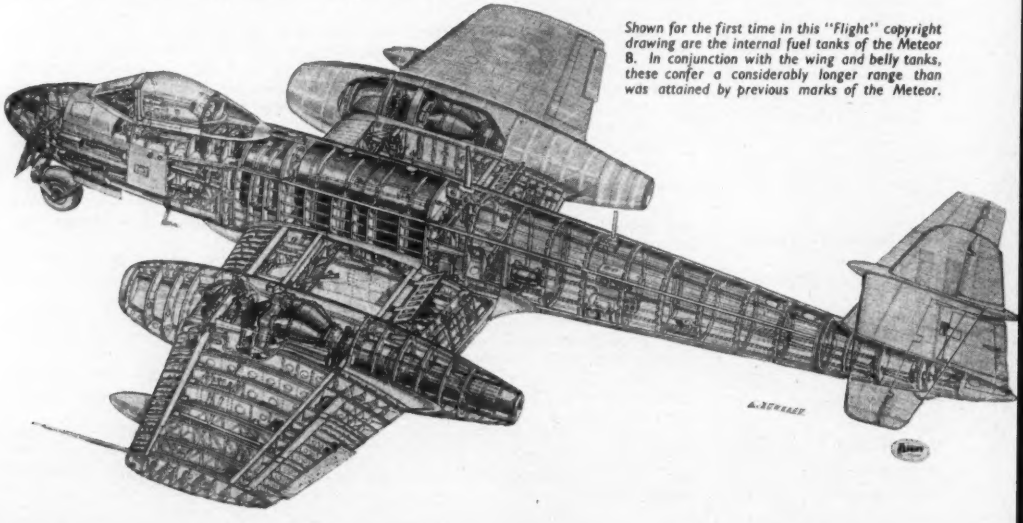
Release of the new information coincides with the arrival of a Royal Australian Air Force Meteor 8 Squadron in Korea. The type is superseding the large numbers of Meteor 4s now serving with the R.A.F. and with the air forces of Holland, Belgium and Denmark, and is being built in Holland by the Fokker company. Components are to be assembled by Avions Fairey at Gosselies, Belgium.

The Meteor 8 is distinguished from the Mk 4 in having a completely redesigned tail unit, lengthened fuselage, revised cockpit enclosure, and a new type of wing-root fillet. The leading edge of the tailplane has a pronounced sweep-back, and the tailplane/elevator assembly is square-tipped. Elevator and rudder areas have been decreased and tailplane incidence has been reduced from 1 deg to zero. The sections of all surfaces are thinner than formerly. The characteristic Meteor fin-cum-skid beneath the tail has been deleted, but the upper fin has been correspondingly increased in area, as well as being changed in outline. The fuselage terminates in a cone-shaped fairing.

The manufacturers claim that improvements incorporated in the Meteor 8 are directed towards "the continuance of its excellent handling qualities up to its limiting Mach number and maximum altitude." They further observe that, though immediate requirements and training demands have necessitated employment of the type on high-altitude interception duties, provision for carrying ground-attack armament has, since the advent of the Meteor 4, formed part of the Meteor's operational equipment. For ground attack the Meteor is able to make a controlled and steady approach to the target, aided by the wing-mounted air brakes. The thrust/weight ratio, particularly after the bombs and rocket projectiles have departed, is such that acceleration is of an unusually high order. Alternative ground-attack loads are two 1,000 lb bombs, carried on special pylon-type mountings, or as many as sixteen rocket projectiles. The standard built-in armament remains as four 20 mm. British Hispano guns, with more than 770 rounds of ammunition.

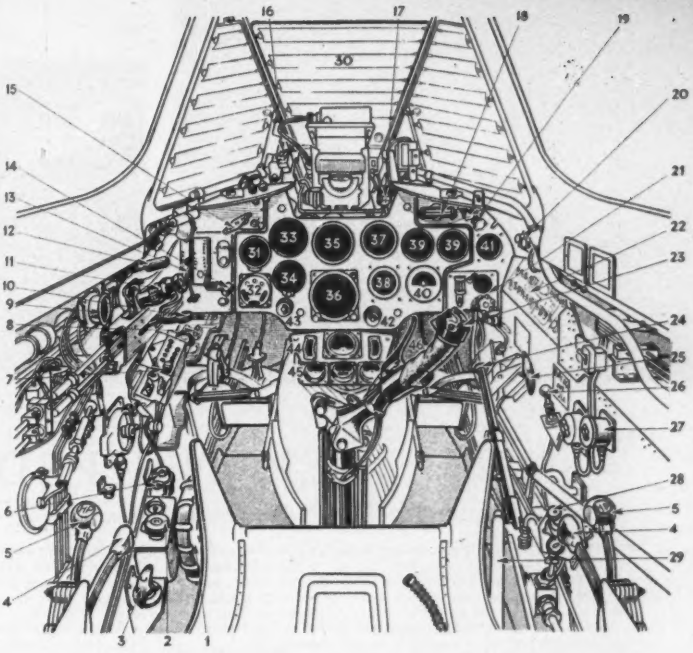
The Meteor 8 is highly manœuvrable even when carrying two 1,000 lb. bombs, as seen here.

A development of the Meteor 8 exhibited at the last S.B.A.C. Display is a private-venture variant for specialized ground-attack duties. This will carry four 1,000 lb bombs under wings and fuselage, or twenty-four 95 lb R.P.s (wings and fuselage); or five external tanks (wing tanks, under-wing and ventral) of 580 gallons total capacity; or, in place of the ventral tank, two extra guns, making a total of six. These extra guns are housed in a large fairing which would



Shown for the first time in this "Flight" copyright drawing are the internal fuel tanks of the Meteor 8. In conjunction with the wing and belly tanks, these confer a considerably longer range than was attained by previous marks of the Meteor.

Located far forward, the Meteor 8's cockpit affords an exceptional standard of visibility. The enclosure is electrically operated and closed by a push button. A Martin-Baker ejector seat is standard equipment.



(1) Elevator trim. (2) Rudder trim. (3) Fuel balance cock. (4) Low-pressure fuel cock. (5) High-pressure fuel cock. (6) Camera-footage indicator. (7) V.H.F. controller. (8) Starting panel. (9) Brake-pressure gauge. (10) Air-brake control. (11) Throttles. (12) Cabin pressure and heating control. (13) Flaps. (14) Undercarriage. (15) Ventral-tank jettison. (16) Gunsight raise/retract. (17) Gunsight emergency retract. (18) Hood jettison. (19) Engine-fire extinguisher. (20) Hood open/shut. (21) Oxygen regulator panel. (22) Armament and external lighting panel. (23) Guns. (24) Hydraulic hand-pump. (25) Undercarriage emergency lower. (26) Emergency oxygen. (27) Gunsight rockets/guns switch. (28) Windscreen de-icing pump. (29) Seat-adjusting lever. (30) Windscreen heating elements. (31) Machmeter. (32) Undercarriage position. (33) A.S.I. (34) Altimeter. (35) Artificial horizon. (36) G4F compass indicator. (37) Rate of climb. (38) Turn and slip. (39) R.P.M. (40) Jet-pipe temperature. (41) Cabin-pressure altimeter. (42) Panel lamps dimmer. (43) Ultra-violet lamp dimmer. (44) Oil-pressure gauges. (45) Fuel gauges. (45) Brake lever.

without doubt accommodate weapons of 30 mm bore if desired. Various mixed loads are possible. Fully loaded, the P.V. ground-attack Meteor requires the assistance of four RATOG bottles—two under the fuselage and two on the fuselage sides. Provision is made for an arrester hook, for land use, mounted well forward beneath the fuselage.

The maximum fuel tankage is 795 gall. The main fuselage tank holds 330 gall; a smaller tank, forward, holds 90 gall; the ventral tank, 175 gall; and the two wing tanks, 200 gall. With all tanks full (in which condition the all-up weight is 19,040 lb) the aircraft has a maximum endurance of 3.2 hr at 30,000ft, the equivalent range being 955 nautical miles.

At an all-up weight of 15,675 lb (internal tanks only) the Meteor 8 has a sea level speed of 516 knots. At 10,000ft the speed is 508 knots, at 30,000ft, 482 knots, and at 40,000ft, 464 knots. Maximum permissible speed is 520 knots e.a.s., and the maximum permissible Mach number 0.82.

The rate of climb at sea level is 7,000ft/min, at 10,000ft 5,630 ft/min, and at 30,000ft 2,760 ft/min. The time of climb to 30,000ft. is 6.5 min. Service ceiling is 44,000ft.

SIR ROBERT SAUNDBY ON AIR POWER

THAT air power is the most effective insurance against the risk of war is an assertion that is no less true for its frequent reiteration. It is now the theme of an article in *The Daily Telegraph* by Air Marshal Sir Robert Saundby, written on his return from a visit to the United States.

The Air Marshal feels that this country must guard against three possible dangers, which are, in order of importance: (i) a quick and decisive blow from the air; (ii) slow strangulation due to interference with our sea communications; (iii) seaborne invasion. To guard against these we require, in the first place, fighters for home defence and bombers to interrupt the enemy's air attacks by destroying the vital components of his war machine. To meet the second threat, air and seaborne forces capable of dealing with air, seaborne and submarine attacks against our merchant shipping are required; and to counter the third danger adequate air power and sea power are needed, for an invasion of this country would be practicable only if our air and sea forces were overwhelmed.

Sir Robert reports a widespread belief in the United States that the recent test in the desert near Las Vegas has shown that small-size atom bombs are now practicable. The Americans, he says, are inclined to think that such weapons would be especially effective in dealing with the traditional Russian tactics—the massing of huge quantities of infantry and artillery for a breakthrough.

The Air Marshal believes that there is a difference in viewpoint between America on the one hand and this country and the Western European nations on the other: while Americans are apt to stress the importance of winning a war, we are prone to concentrate on the importance of preventing it.

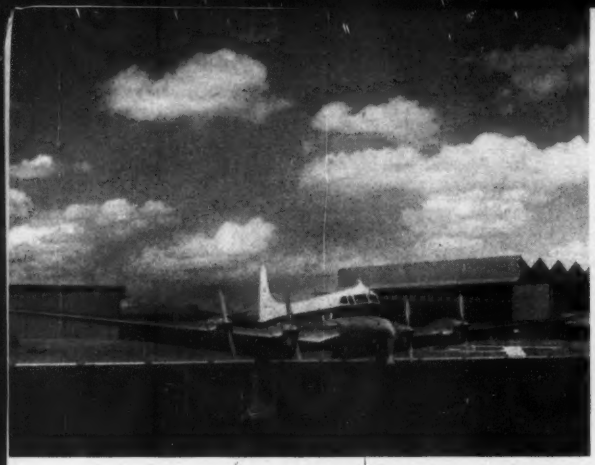
In present circumstances it is inevitable that the largest national air force in the Atlantic Treaty organization should be that of the U.S.A., writes Sir Robert, and goes on to state that he was privileged to visit a number of U.S.A.F. bases and to talk to many officers, from generals to junior aircrew. He was deeply impressed. Standards of flying, navigation and airmanship, he reports, are such that the U.S.A.F. had nothing to fear from comparison with any air force in the world. Standards of intelligence and physique are outstanding; discipline and training are excellent. In aircraft and technical equipment the U.S.A.F. in some important respects leads the world. Their fighters and radar equipment are in the front rank for quality and performance. But it is in the realm of the long range bomber that their greatest advance is to be found. In the B-50, and still more in the B-36, they have bombers of outstanding range, carrying capacity and defensive qualities.

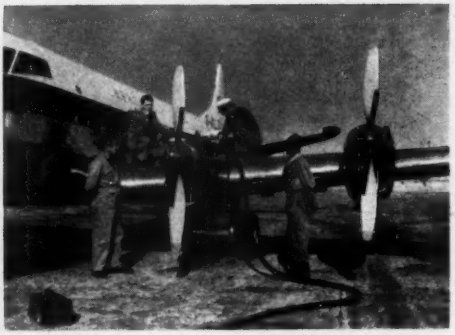
Air Marshal Saundby remarks that the Americans have paid a compliment to the R.A.F. by choosing for their uniform-colour a light blue-grey very similar to Air Force blue.

"A COMPLIMENT TO ENGLAND"

SPEAKING at the annual general meeting of the English Electric Co., Ltd., last week, Sir George H. Nelson, the chairman, referred with justifiable pride to the 4 hr 40 min crossing of the Atlantic by a Canberra; he also paid a warm tribute to all who had been connected with the venture, from the employees at Preston to the R.A.F. crew, and including the R.A.E. and N.P.L. for their share in the development of the type. Sir George went on to say that he looked upon the agreement with the Glenn Martin Company to manufacture the Canberra in the United States as "a compliment to this country."

In other parts of a detailed review of English Electric's work in 1950, the chairman described his recent tour of the company's branches and associates in Canada, Australia, New Zealand, India and Pakistan, and then went on to speak of the associated concerns at Home, notably Marconi's and Napier's. He reminded his audience that the latter company's activities were not confined to aircraft power units, but included many other types of internal-combustion engines and associated compressors, together with exhaust turbo-superchargers for Diesel engines. Government work, details of which he was not permitted to disclose, represented a substantial part of Napier's business.





The Heron during its tropical trials: (left) the aircraft parked at Eastleigh, Nairobi; (right) refuelling at El Adem, North Africa.

THE HERON'S PROGRESS

de Havilland Feederliner will go into production this year

THE de Havilland Heron prototype feederliner, powered with four Gipsy Queen 30 engines, has now completed more than 286 hours' flying at home and abroad. Trials are nearly complete, production planning is in train and production will start this year. The second machine to fly is likely to be fitted with a retractable undercarriage, which should give it a performance more suited to the requirements of longer stage-lengths.

The photographs above show the Heron during its successful tropical trials in Africa last year. Flown by Mr. Geoffrey Pike, it left England on November 24th and flew to Khartoum and Nairobi by way of France, Italy, the North African coast and Cairo. Hot-weather and high-altitude take-off trials having been successfully completed, the machine returned to Hatfield on December 20th. In the round trip of 83 flying hours only routine maintenance was necessary.

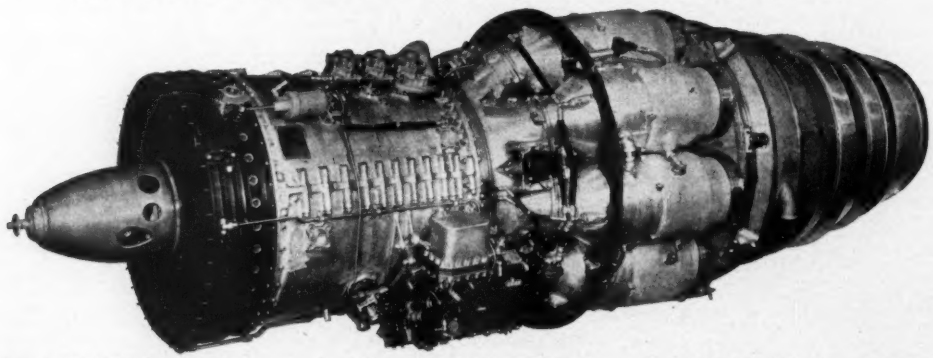
The Heron is the outcome of de Havilland's approach to the problem of replacing the D.H.86 and in their resultant conception of a feederliner the manufacturers have embodied several qualities which render it capable of replacing not only the D.H.86, but—under certain conditions—the Dakota as well. For certain feeder-line operations it is generally agreed that the Dakota is too large to be economical; in addition, it requires facilities which are perhaps a little beyond the pockets of many municipal airfield owners. While the Heron's configuration and wing-loading give it take-off and landing characteristics almost comparable with those of the Rapide, on short stages it is also capable of block-to-block speeds which compare very favourably with those of the Dakota. Compared with the Dakota, also, the simplified mechanical systems which have been used make possible a considerable lowering of maintenance costs.

The Heron profits, too, from the fact that many identical components of the well-tried Dove have been used in its construction. By virtue of its larger size it is expected to have a lower direct operating cost per ton-mile of payload than the Dove.

To quote a typical performance, with a payload of 2,240 lb, the Heron has a practical stage-length of about 385 miles, with standard allowances, cruising at 162 m.p.h. At the other end of the scale, it can carry 3,000 lb of payload over 50-mile stage-lengths with standard allowances. Route trials will probably be conducted later this year.

Now that the present international situation seems, to some extent, to have tied the hands of American manufacturers in the feederliner field, it is conceivable that the Heron may have an appeal in the United States. Its purchase price of approximately £35,000, should, particularly when converted into a dollar equivalent, render it a most acceptable proposition for use on many of the short American feeder routes where a high cruising-speed is not a primary requisite for economical operation.

AVON—POWER FOR PEACE AND WAR



A great rarity is this photograph, the first to be released for many months, of a Rolls-Royce Avon axial turbojet. Details of this, the most important power unit in the R.A.F.'s re-equipment plans, are withheld but its capabilities may be judged by the climb performance it bestows upon its Meteor test-bed and upon the Canberra. Avons of the Mk I (or RA.3) series, here depicted, powered the Canberra which recently flew the North Atlantic to America, and similar units will be in the Avro Canada Canuck, soon to attempt the return direct flight. Comets with four Avons may, in the future, follow-up such flights with regular services across the Atlantic. The power of the Avon Mk I is given as 6,500 lb static thrust.

TURBINE-BLADE FINISHING

LAST month we were able to make a brief reference to an unusually interesting new machine for finishing turbine blades. As then explained, it is an adaptation of an earlier design of machine—the work of Mr. S. A. Czarnecki of the Hamilton Standard Division of United Aircraft Corporation—used for contour-grinding of duralumin airscrew blades. The system is to strop the blades with the aid of an endless abrasive belt. Enquiries of Hamilton Standard have brought the answer that at this stage the Corporation are not prepared to release any more details; nor, incidentally, is the accompanying picture as revealing as one would wish.

It seems that for security reasons work on the development of this machine was given the name *Buckingham Project* (after the designer's home town) and the number M.1949. At first the power of the motor provided was insufficient, and it has now been found that 15 h.p. motors are required. These, together with a new oil-based coolant, have made possible the high-speed removal of stock without distortion or the setting up of surface stresses—a principal aim during the research period. An automatic feed system has now been added, and experiment (with the co-operation of Sandpaper Inc. of Massachusetts) has shown that a degree of flexibility can be achieved through the use of different types of abrasive belts. Up to 3/32 in of stock can now be removed in about fifteen minutes, and the finished product is said to be superior in surface finish to that obtained by other methods.

Checking blade-profiles, finished by the high-speed stropping process on the new machine seen in the background. In the foreground is a batch of blades awaiting finishing.

PRODUCTION ADVISERS APPOINTED

THE appointment was recently announced of three rearmament-production advisers to the Minister of Supply. One of the new posts, with the title of Deputy Controller of Supplies (Aircraft) Production, will be occupied by Mr. W. C. Puckey, M.I.P.E., F.I.I.A., who is director and general works manager of Hoover, Ltd., and is also chairman of the council of the Institute of Production Engineers. During the war he controlled 17 Hoover factories largely engaged on aircraft-component work.

Managing director of John Brown and Co., and a director of the Firth-Brown organization and its many subsidiaries, Mr. S. W. Rawson is appointed to the post of Director General of Machine Tools, while the third new appointment—that of Deputy Controller of Supplies (Munitions) Production—goes to Mr. A. G. E. Briggs, asst. managing director of Tube Investments, Ltd.

R.A.E. TECHNICAL COLLEGE

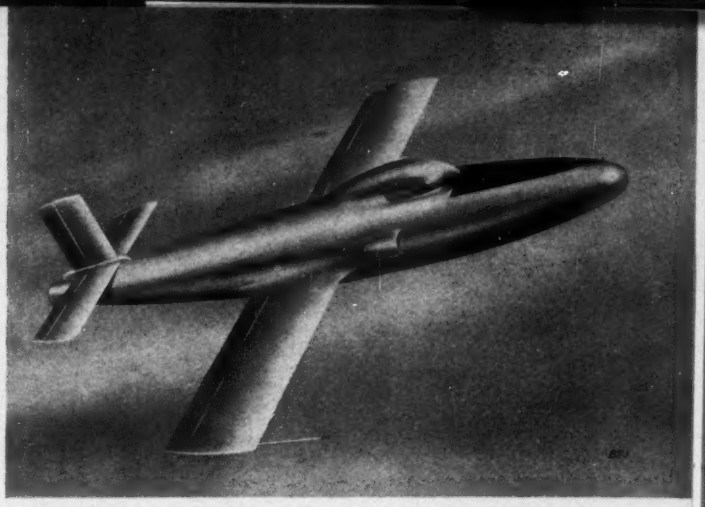
IN the present 1950-51 session 548 students are attending the R.A.E. Technical College, Farnborough. In the previous session there were 438, of whom 178 were engineering apprentices, 143 craft apprentices and 117 scientific assistants. These figures were announced when, recently, the Minister of Education, the Rt. Hon. George Tomlinson, M.P., presented prizes to students.

That the year had been noteworthy for the number of successes obtained by the students was remarked upon by Sir Frederick Handley Page, chairman of the board, who expressed the belief that a high level of technical education was of vital importance if our standard of living was to be maintained. He remarked also that, since a constant exchange of skilled technicians was desirable throughout industry, the R.A.E. College might well look beyond the needs of Farnborough.

"Flight" photograph

FIRST OF THE FLEET: Third de Havilland Comet to be built, G-ALYP is pictured here during a test flight from Hatfield last week. This aircraft, with production-type bogie-wheel undercarriage, will be handed over to B.O.A.C. later this year, taking its place as the flagship of the world's first pure-jet airliner fleet. The first and second prototypes were built for the Ministry of Supply, although the second is being lent to B.O.A.C. for route trials. The fourth Comet, incidentally, is expected to fly in about two months.

HERE AND THERE



ARTIST'S IMPRESSION of the first Australian-designed jet aircraft—the prototype target-aircraft built by the Government Aircraft factory and now being tested at Woomera, Western Australia. This version, carrying a test-pilot, is powered by an Armstrong-Siddeley Adder turbojet; production models, with the expendable A.S. Viper unit, will be pilotless.

Princess to Watch Races

THE Festival of Britain National Air Races, to be held at Hatfield on June 23rd, will be attended by H.R.H. Princess Elizabeth.

The Pathfinder Club

THE membership-list of the Pathfinder Club is full, and a waiting-list is now being compiled for vacancies after May 31st. Details of membership—open to all past and present members of the R.A.F.—may be obtained from the Secretary at 115, Mount Street, Berkeley Square, London, W.1.

Cool Comfort

WOUNDED troops—British, Greek, Turkish and French—flown home from Korea by the R.A.F. Transport Command ambulance service are kept cool on tropical airfields by Coolair Minor refrigerator units, built by a British company—M.L. Aviation, Ltd. These small vehicles, capable of producing two tons of refrigeration per hour, cool air from the atmosphere and pump it into the fuselage of the Hastings ambulance through a large flexible pipe. Coolair units, already in use at Negombo, Ceylon, are also being installed at other routine staging-posts—Mauripur, Habbaniya and Luqa.

Dramatic Rescue

SIXTEEN American fighters brought guns, bombs, rockets and napalm bombs to bear on Chinese troops hiding in a Korean orchard when their presence threatened the rescue of Sgt. Cecil Fly, a shot-down Australian Mustang-pilot. A helicopter which tried to rescue Fly was hit by bullets from Chinese guns only 300 yards away, and had to abandon its attempt. After the fighter strike a second helicopter picked up the Australian pilot; it was also hit, by rifle fire, but managed to reach safety. Of the helicopter pilot, Capt. Lynden Thomson, a member of the Australian squadron said, "Men don't come any braver." A different kind of helicopter rescue operation, of an unusual nature, is illustrated on facing page.

Filton Firefighters

THE Bristol Aeroplane Company's fire brigade at Filton acquitted itself well in a recent test when a derelict Beaufighter was ignited 1½ miles from the brigade H.Q. The crash tender was on the scene in 2 min 10 sec and its crew went into action two seconds later, using foam and CO_2. A dummy pilot and observer were "rescued" inside the next 38 seconds, and the extinguishing operation was completed 3 min 5 sec after the alarm.

Guided-bomb Attacks

SINCE last August, B-29s of the U.S. Far East Air Force have been dropping 12,000-lb radio-controlled bombs on targets in Korea. The 27-ft missiles, known as Tarzons, are directed towards their target by the bombardier, using radio signals originally picked up by a receiver in the bomb itself.

One of the B-29 units engaged, the 98th Bombardment Group, has dropped over 14,000 tons of bombs since it arrived in Japan last September.

Meteors for Korea

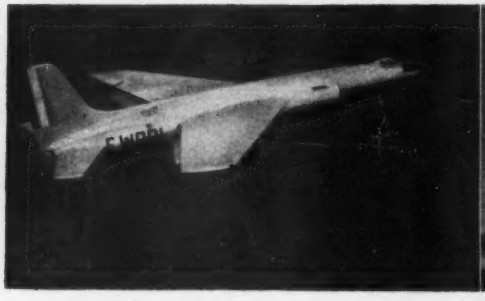
PILOTS of No. 77 Mustang Squadron of the R.A.A.F. in Korea will shortly be flying Gloster Meteor 8s in combat; the British jet aircraft have arrived and conversion-training is under way. Recently, a number of R.A.A.F. pilots underwent a course on Vampires in Australia and have now been posted to 77 Squadron to pass on their knowledge of jet technique. In addition, S/L. Richard Cresswell, the C.O., and F/L. Desmond Murphy, have recently been studying American tactical use of jet fighters in Korea. Each flew ten sorties in F-80 Shooting Stars of the Eighth Fighter-bomber Group.

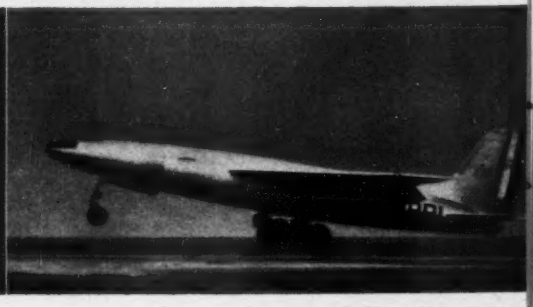
The Australian squadron's work in Korea has earned the respect of all arms of the U.N. forces in Korea. Five of its pilots have now made considerably more than 100 sorties.

U.S.A.F. Orders More Packets

TO increase the strength of its troop-carrying and supply-dropping fleet, the U.S.A.F. has placed a large order with the Fairchild Co. for a new version of the C-119 Packet—powered by Wright Turbo-Cyclone 18 engines, compounded units rated at 3,500 h.p. Use of the new power-plant is expected to increase the Packet's

PREMIER VOL: Two views of the first flight—at Orleans-Bricy airfield on March 15th—of the French S.O. 4000 experimental jet bomber (two French-built Rolls-Royce Nenes). The characteristics of this high-performance aircraft had previously been investigated by the single-Nene S.O.M1 scale-model, which attained 625 m.p.h. The "bicycle-type" undercarriage, and wing-tip outriggers were left extended during the first flight.





HERE AND THERE . . .

endurance by reducing the fuel consumption.

Recent accomplishments by the Packet include the dropping of components for a complete bridge to U.N. forces in Korea. The C-119 Packet—now being produced by Kaiser-Frazer and Fairchild—can carry 30,000 lb of payload, in the form of 42 paratroops, 64 airborne troops or 35 stretcher cases. An earlier version, the C-82, is illustrated on page 367 of this issue.

Atar Type-test

A PROVISIONAL static-thrust rating of 5,290 lb has been announced for the French Atar 101 axial turbojet, which is under vigorous development by the S.N.E.C.M.A. concern. The rating was established during a recent 150-hr type-test. Flight trials are being made with an Atar 101 installed in a Martin Marauder, based at Istres; it logged 60 hours' development flying during three weeks of February.

American Racing Problem

ORGANIZERS of the American National Air Races have been told that military participation, liberal in previous years, will now be permitted only during Armed Forces Week in May. Cleveland, normally, the venue for the races, is not available for the 1951 events, as the bomber factory there has been converted for tank manufacture and use of the airfield would now be "impracticable." It has proved difficult to find another suitable airfield and the races may not be held this year.

More Festival News

AS previously announced, Festival of Britain Model Flying Championships are to be held at the Empire Stadium, Wembley. The date for this new event—a highlight in British aeromodelling activity—has now been advanced to July 14th. Visiting enthusiasts from overseas who provide proof of membership of their own national model-aeronautics controlling body will be granted honorary membership of the Society of Model Aircraft Engineers, permitting them to take part in the Festival contests. The Society is making another contribution to Festival activities by staging control-line and radio-control demonstrations during the National Air Races at Hatfield on June 23rd.

Crossing by the Canuck

ROLLS-ROYCE Avon turbojets are likely to be used in another direct crossing of the Atlantic by a jet aircraft—the Avro Canada Canuck, expected to make the trip in spring or early summer. Flying in the opposite direction to the Canberra, which recently made the 2,000-mile Aldergrove-Gander crossing in 4 hr 40 min, the Canuck will probably use the same airfields. Prevailing winds will favour the Canadian aircraft, which is almost certain to reduce by a fair margin the Canberra's record transatlantic time. Incidentally, S/L. Bill Waterton, who made the initial flight-tests on the Canuck, has lately returned to England and has resumed work as the chief test pilot of the Gloster Aircraft Co.

Air Ambulances Pay

AIR evacuation is named by Lt.-Gen. H. G. Armstrong, Surgeon-General of the U.S.A.F., as one of the principal reasons for the reduced death-rate sustained among casualties in the Korean campaign, as compared with World War II. The proportion of deaths among men who reach aid stations is, so far, 2 per cent; the comparable figure in the last war was 4½ per cent.

Front-line evacuation is carried out mainly by helicopters, and C-97s, C-74s and C-54s are used to fly the wounded (recently, at a rate of 320 per day) to California from Tokyo *via* Hawaii. Ninety-five per cent of U.N. soldiers wounded in Korea have been taken out by air. All the four-engined ambulances are used on the U.S.-Tokyo airlift, and would return empty were it not for the casualty evacuation scheme.

Seventh Commonwealth Lecture

THE Royal Aeronautical Society announces that the seventh British Commonwealth and Empire Lecture is to be read in October next by a senior officer of the Royal New Zealand Air Force—A.V-M. Sir Leonard Monk Isitt, K.B.E. The title of the lecture and the exact date on which it is to be given are to be announced later.

Small French Jets

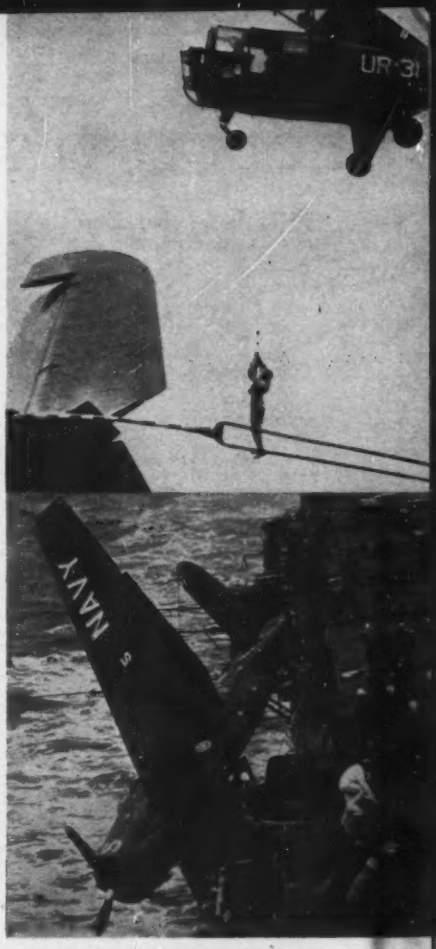
FOR its latest light jet-aircraft, the C.M. 88-01, the Fouga concern has chosen a double-barrelled name—Castor et Pollux. The first prototype, now flying, has two Turboméca Piméné turbojets, but the ducted-fan Aspin of 440 lb thrust will later be installed.

The Sipa concern, another French company exploring the possibilities of small jet aircraft, is now building a light twin-jet trainer for the French Air Ministry.

Home for a Heroine

MANY readers will remember the outstanding colour film *Memphis Belle* made by the American Government during the war; it told the story of one bomber and her crew during a daylight raid on Germany. When the aircraft, a Boeing B-17 Fortress named *Memphis Belle*, had completed 25 missions, the crew flew it back to the States for a second "tour"—selling war-bonds.

After the war, an anonymous citizen of Memphis bought the *Belle* from a scrap-heap for $300, and presented her to the city. A local newspaper recently discovered the neglected airframe in a field at Memphis Airport. Public feelings were aroused, and the American Legion has now placed *Memphis Belle*, still wearing war-paint and gun-turrets, on a permanent concrete base in the city, where it forms an impressive war memorial.



MAN OVERBOARD: Probably the most unusual rescue effected by a U.S. Navy helicopter occurred recently in the carrier "Palau," when this Grumman Avenger hung suspended over the ship's side by an arrester wire. The pilot was unable to abandon aircraft without falling into the sea until a Sikorsky S-51 helicopter, piloted by Lt. Milner of Utility Squadron 2, hauled him to safety.

NEWS IN BRIEF

AT a meeting of the Aircraft Golfing Society on the Mid-Herts course at Wheathampstead on March 17th, Marshall Walker won the Ingersoll Trophy with a score for the Stapleford Competition of 34½ points, playing from a handicap of 14. The next meeting is at the Finchley Golf Club on April 7th, for the Captain's Prize.

* * *

On April 20th, at 8 p.m., Mr. Peter Masefield is to address the West London Aviation Club on "The Development and Trend of Civil Aviation." Guests will be admitted on signing the visitors' book. The club meets at Beaufort House School, Lillie Road, Fulham, near the Empress Hall.

* * *

After nearly five years spent in this country in the capacity of chief of the London bureau of McGraw Hill World News, Mr. F. R. Brewster is returning to America to take up a new post as assistant public relations manager of the Pratt and Whitney Division of United Aircraft Corporation. He will be second in command to another ex-McGraw Hill journalist, namely, Bob Hotz, whose work as news editor of *Aviation Week* of America will be remembered.

* * *

As part of its golden jubilee celebrations, the British Standards Institution is to hold an exhibition which, it is stated, will be representative of the use of standards by almost every section of British industry. It will be held at the Science Museum, South Kensington, from June 18th-28th.

* * *

E. K. Cole, Ltd., announce that Mr. Harold Hunt, M.Brit., I.R.E., has been appointed chief of development and engineering, and will be responsible to Mr. A. W. Martin, M.B.E., Ekco chief engineer.

CELESTIAL-NAVIGATION TRAINER

Simulation of the Polar-region Problems

CLAIMED to be the latest development in celestial navigation training, a 22-ton dome has recently been delivered to the United States Air Force. It is known as the D-2 high-speed, high-latitude celestial navigation trainer, and has been designed by the manufacturers—Link Aviation, Inc., Binghampton, N.Y.—in co-operation with U.S.A.F. Air Matériel Command specialists.

The dome is the first ground-training device capable of reproducing the polar region navigation problem with an accuracy consistent with present training requirements in America. Fourteen tons of structural steel and welded tubing make up the trainer dome and its associated structure, the gimbal and two supporting pedestals. Another eight tons is added by the observer's platform, with its circular staircase and supporting pedestal.

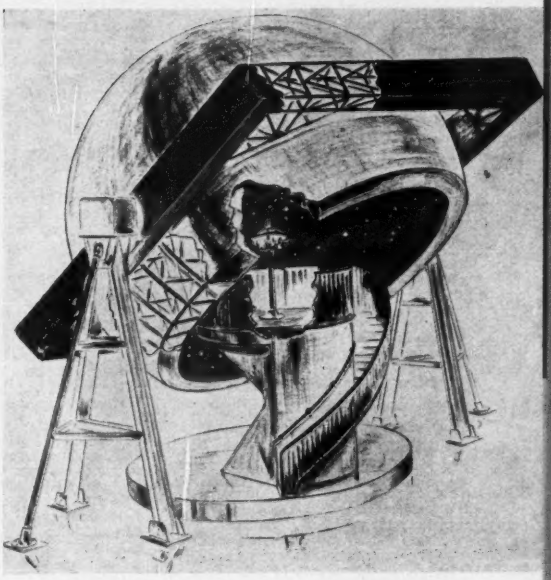
In spite of their size and weight, both the massive dome and platform are capable of independently controlled movements geared to microscopic accuracy. The high-speed dome represents the heavens of the entire northern hemisphere plus 35 deg of the southern hemisphere. Over 500 stars in correct constellational position give the illusion of the normal night sky.

All first- and second-magnitude stars and necessary third-magnitude ones are reproduced with controllable brilliancy. Twenty-three of the important navigational stars are collimated for navigational purposes. All major stars are located within accuracies of 1½ min of arc—less than 1/12th of an inch.

The gimbal system on which the dome is mounted some 20ft above the ground provides freedom of movements for simulating terrestrial travel and sidereal time. The rotatable observers' platform which rises in the centre of the dome gives simulated aircraft heading. The combination of the two allows complete reproduction of any instantaneous flight condition of progressive situation during the elapsed time of flight.

The instructor has complete control over the flight problems from beginning to end. He is provided with controls for positioning the dome and establishing correct aircraft heading.

He can set up navigational problems of any degree of complexity with a wide range of variables—airspeed 0 to 1,500 kt; altitude 0 to 100,000ft; terrestrial position 25 to 90 deg north latitude; radius of action to 15,000 n.m.; wind velocity 0 to 300 kt from any direction; and free-air temperature of + 40 to — 70 deg C.



An artist's impression of the new training device. The lower part of the dome has been cut away to show the six periscopic sextants.

For increasing the complexity of any problem the instructor may change almost any one of these variables during the course of the flight simulation.

Sights can be taken by six students at a time from the observers' platform, which is equipped with six periscopic sextants. To increase training capacity these six observers are not only in constant communication with the instructor, but with a larger group of students to whom their observations and data are relayed.

Provision is made for 30 additional stations through which the student navigators receive flight information—indicated air speed and altitude, free-air temperature, gyro-compass direction and time. With this information and other details relayed from the observers' platform they are able to make computations and solve navigational problems between the periods of sight-taking.

R.Ae.C. AVIATORS' CERTIFICATES

BELOW is a further list of R.Ae.C. Aviators' Certificates, covering the period from January 16th, 1951, to March 5th, 1951. The previous list (November 27th, 1950, to January 16th), was published in *Flight* for February 23rd last.

No.	Name	Club or School	Date
26,985	John Malcolm Grierson ...	Portsmouth Aero Club	16.1.51
26,986	John Tracey Ware	Exeter Aero Club	18.1.51
26,987	John McLaren Ashfield ...	Plymouth and Dist. A.C.	18.1.51
26,988	Brian Geoffrey Harris ...	Cheltenham Aero Club	18.1.51
26,989	James Fairlie	Qualified Service pilot	18.1.51
26,990	Edwin Shilton Griffiths ...	Qualified Service pilot	18.1.51
26,991	Keith Robin Boeston	London Aeroplane Club	22.1.51
26,992	Christopher Raoul Holland ...	London Aeroplane Club	22.1.51
26,993	Kurt Weininger ...	Northants Aero Club	22.1.51
26,994	Michael Leonard Arthur Jones	Fairoaks Aero Club	26.1.51
26,995	Barbara Elizabeth Pickett ...	Southend Municipal F.S.	26.1.51
26,996	Raymond Leonard John Jones ...	Qualified Service pilot	26.1.51
26,997	Peter Douglas Grey	Redhill Flying Club	26.1.51
26,998	Sunder Mansukhani	Rochester Flying Club	26.1.51
26,999	Michael M. Omishi	Royal Aero Club	26.1.51
27,000	... ...	...	
27,001	David Charles Armstrong ...	U.L.A.A. Experim'ntal Gp	29.1.51
27,002	David Martin Burnett	Exeter Aero Club	29.1.51
27,003	Colin William Smith	Cambridge Aero Club	29.1.51
27,004	Walter Bruce Semmens ...	Hereford Aero Club	29.1.51
27,005	Donald Donaldson-Stiff ...	Tees-side Flying Club	30.1.51
27,006	Leonard Joseph Latham ...	Liverpool Flying Club	2.2.51
27,007	Thomas Patrick Joseph Walter d'Alton Bourke	Redhill Flying Club	2.2.51
27,008	John Maxwell Reid	Portsmouth Aero Club	2.2.51
27,009	Michael Eveleigh Rankin ...	West London Aero Club	2.2.51
27,010	William Kinnersley	Northants Aero Club	2.2.51
27,011	Brian Henry Percy Willis ...	Fairoaks Aero Club	5.2.51
27,012	Robert Ernest Wright ...	Rochester Flying Club	5.2.51
27,013	Denzil Gaughan	Wiltshire School of Flying	5.2.51
27,014	Kalyan Dutt	Wiltshire School of Flying	5.2.51
27,015	Roderick John Armstrong ...	Qualified Service pilot	7.2.51
27,016	Stuart Cardy Orrell	Qualified Service pilot	8.2.51
27,017	Peter Craig Buchanan	Qualified Service pilot	8.2.51
27,018	Philip Edwin Lovell	Hampshire Aeroplane Club	8.2.51
27,019	Saxon Rowland Knight	Fairoaks Aero Club	13.2.51
27,020	Jack Stearn McWicker	Qualified Service pilot	15.2.51
27,021	John Spencer Rivaz	London Flying Club	15.2.51
27,022	Docree Roy Foster	Qualified Service pilot	15.2.51
27,023	Robert Hugh Wiltshire ...	Air Service Training	19.2.51
27,024	Norbert Modeste Ghislain Paul Leroy	Cambridge Aero Club	16.2.51
27,025	George Herbert Seavey Starks	Service pilot u/t	19.2.51
27,026	Arthur Patrick Tuxford ...	Coventry Aeroplane Club	22.2.51
27,027	Peter Alistair Riddoch	Fairoaks Aero Club	23.2.51
27,028	John Michael Challen	Fairoaks Aero Club	24.2.51
27,029	John Rawlinson	Liverpool Flying Club	26.2.51
27,030	Roger Christopher Lanton ...	Northants Aero Club	26.2.51
27,031	William Edwin Hawkes	Southend Municipal F.S.	26.2.51
27,032	Frederick Thomas West ...	Fairoaks Aero Club	28.2.51
27,033	Alan Smith	Newcastle Aero Club	2.3.51
27,034	Peter Treston Cunnington ...	Qualified Service pilot	1.3.51
27,035	John Nichols Hubbard	Qualified Service pilot	1.3.51
27,036	Richard Geoffrey Large ...	Qualified Service pilot	1.3.51
27,037	William Hilmer Entress ...	Qualified Service pilot	1.3.51
27,038	Leslie Horace Lee	Qualified Service pilot	1.3.51
27,039	John Charles Sloan	Qualified Service pilot	5.3.51
27,040	Bernard William Lydiate ...	Rochester Flying Club	5.3.51

Back to their Ruined Runway

The fighter flying boat Squadron returns to find its base heavily bombed by the few enemy bombers which had eluded its attack. But happily water does not crater and the victorious fighters are able to land on a perfect surface.

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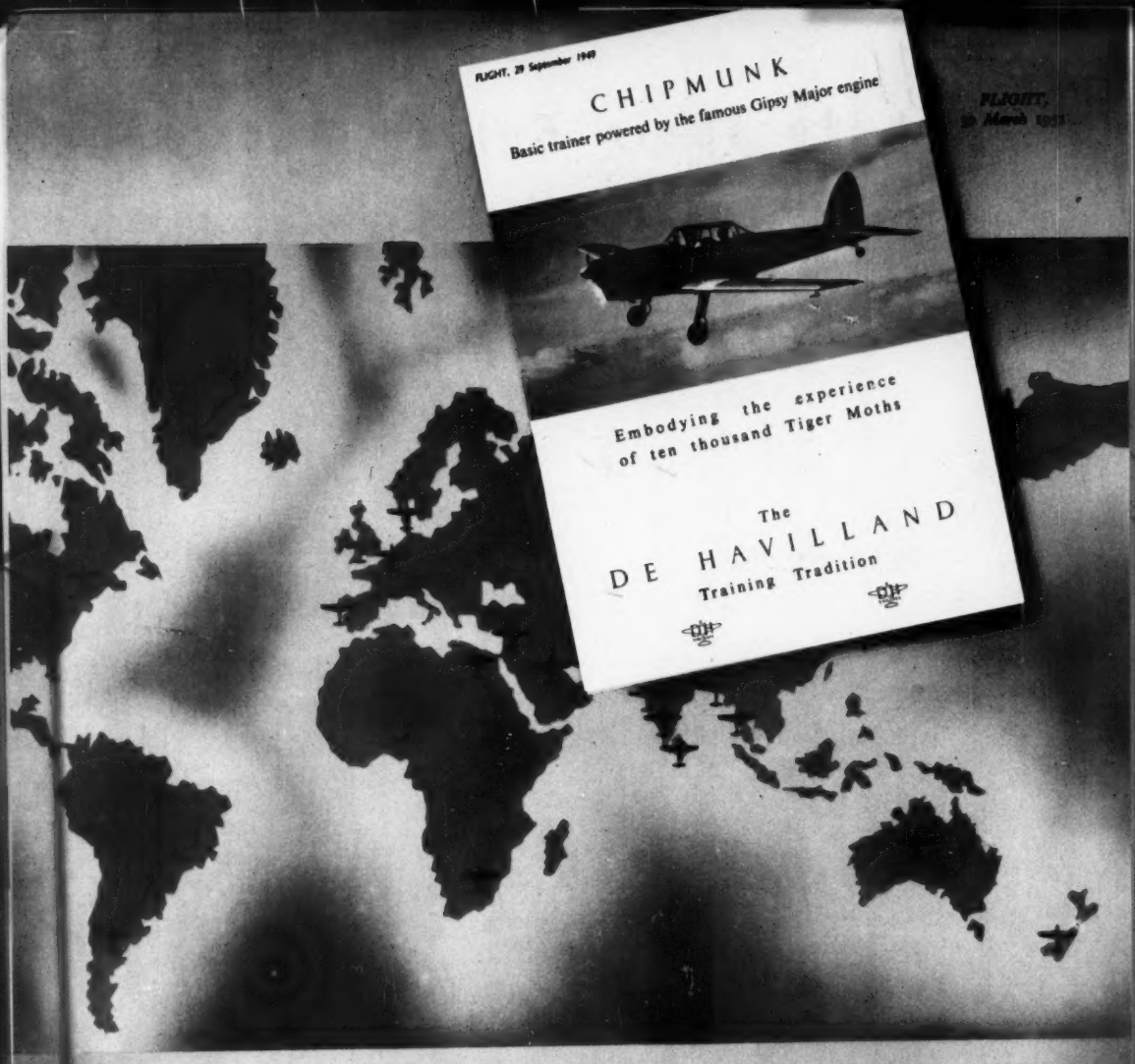

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PORTRAIT OF A PIONEER

One Year of Fame: the Meteoric Flying Career of Hubert Latham

By COLIN BOYLE

In spite of his achievements, few portraits of Hubert Latham exist.

WHILE the name of Louis Blériot is known even to the younger generation, that of his rival on the Channel flight, Hubert Latham, is familiar only to those who have studied aviation history or are old enough to remember the early days of flying. Readers will recall an article in Flight of July 1st, 1949, in which Harry Harper, veteran aviation journalist, re-told the story of Blériot's Channel crossing. Here another contributor, who has delved into the chronicles of the period, writes of the brilliant flying and consistent ill-luck of Latham.

IF you leave Calais by the Boulogne road, and bear right at Coquelles, you will come to the little seaside village of Sangatte. This village has a certain claim to fame, in that work was started here on the French end of the Channel tunnel, but there was once another occasion when it was a centre of interest for both England and France. Go through the village, and climb up the coast road, past the little war memorial, and presently you will see before you the bronze figure of a man, dressed in the cap, Norfolk jacket, and knickerbockers of the Edwardian sportsman. It stands by the roadside, with the high ground of Cap Blanc Nez behind it; and if you examine it you will find that it is of Hubert Latham, and erected by the Aero Club de France.

When I was there two years ago, the great cross-channel guns were still emplaced in the low inland hills, and all the ground before them, right to the foot of the statue itself, was riddled and honeycombed with crater on crater, crater beside crater, until the whole seemed like some fantastic valley of the moon. Behind, on the slopes of Cap Blanc Nez, lay the German look-out posts and anti-aircraft stations, whose paths wound round the foot of the statue itself. But in this valley of desolation the statue still stood untouched and impassive. The name of Latham meant little to me then, but the discovery of the lonely statue amid so much ruin and destruction piqued my curiosity, and I set about finding out more about him.

Hubert Latham, the son of an Englishman, was born in Paris in 1883. He was educated in Paris and at Oxford, so that, in spite of the French nationality which he retained, he could with justice be called an Anglo-Frenchman. He acquired, while still a young man, a reputation as a sportsman, but it was as an airman that he became famous. It is difficult to obtain much information about him, apart from stories of his air exploits, but I have been told that he first took up the then hazardous pastime of flying on being told by his doctor that he had only one more year to live; and he was determined to live that year as fully as possible. However this may be, it is a fact that he lived for several years longer, and at last died a violent death. A footnote to a paper on flying published in 1909 says that he was learning to fly in order to explore Africa from the air—surely a courageous ambition!

In the spring of 1909 the Antoinette Engineering Company of Paris, which had for some years been experimenting with aircraft, produced a machine to the design of M. Levavasseur. It was a monoplane, and was for those days very large and graceful. It was called the Antoinette after the company, and the famous motor which powered it. The services of Hubert Latham were retained as a pilot. He spent a few weeks practising with the aircraft, and then, early in June, burst into the limelight by setting up a European endurance record of 1 hour, 7¼ minutes. During this flight he was seen to remove his hands from the controls, and calmly to roll and smoke a cigarette. He was certainly the first airman to treat his craft with such scant respect; and when the position of the pilot on an Antoinette is considered—he was perched up on, rather than in, a narrow fuselage, in the full blast of the slipstream—it was a most remarkable feat.

In its issue of June 19th of that year, *Flight* commented on the advent of Latham, which it called "Byronic", and went on to say that, now the preliminary technical work had been done, the new science of aeronautics needed men like him, who were prepared to take great risks to prove their machines.

Soon afterwards came an event which more than any other took men's fancy, and established aviation as an accomplished fact. The *Daily Mail* had offered a prize of £1,000 to the first man to fly the English Channel, and a number of aviators were determined to carry off the award. Early in July the great Anglo-French pioneer Farman came to Calais to examine the lie of the land, and soon afterwards Latham set up his camp at Sangatte, while the Comte de Lambert established one farther down the coast at Wissant.

Latham, in particular, had set his heart upon this prize and this honour. He had already crossed the Straits in a balloon, and felt quite confident of crossing it in his Antoinette. The Comte de Lambert, who was flying a Wright biplane, soon eliminated himself as a competitor by crashing his aircraft, and for a while, Latham had the field to himself. He made several practice flights, and once had a crash himself, coming down heavily in a cornfield; but fortunately his machine was little damaged, and soon he was waiting only for favourable weather.

The French destroyer *Tarpon* had been told off as an escort for Latham, and M. Levavasseur, who was managing the attempt, installed himself on board. The morning of July 19th dawned calm and clear, the Channel was oily and smooth, and wireless reports from Dover (the first wireless weather reports) said that there, too, the weather was fine. Accordingly, at 6.15 a.m., M. Levavasseur ordered the firing of the three guns which were the signal to Latham to start. In less than half an hour the pilot was in the air and, climbing to a thousand feet, set out for England. He soon overtook the destroyer and, as he passed over it, tried to take a photograph. But even as he was focusing his camera the engine of his aircraft began to miss and slow down. He tried all the electrical connections in his reach, he tried adjusting the fuel and air supply; but it was all in vain, and at last he had to be content with bringing the Antoinette smoothly down on the water, and as near to his escort ship as possible.

It was characteristic of Latham that he had made no effort to see if the monoplane would float or not; he had merely assumed that it would. Fortunately, the event proved him correct; in the calm sea it floated easily and, while he waited to be rescued, he again casually

Latham's graceful Antoinette monoplane during its sensational flight in a high wind at the Blackpool aviation meeting held in October, 1909.

"Flight" photograph

PORTRAIT OF A PIONEER . . .

rolled and smoked a cigarette. He was taken dry-shod from the cockpit of the Antoinette.

The machine was salvaged as well, and an examination of the engine showed that a piece of wire had worked its way into it, causing the misfiring. But the Antoinette was too damaged to be used again, and that night saw Latham at Paris, demanding a new one from the works.

He was back almost at once, reassembling his new machine at Sangatte, but meanwhile the redoubtable Blériot had arrived on the scene, setting up his camp at Les Barraques, a spot nearer Calais. Blériot, unlike Latham, was a constructor and experimenter as well as a pilot; for years he had been working on his monoplanes, and had survived many crashes and endured much ridicule. But at last he had a really practical aircraft, as he had shown only a week earlier, when he had flown 25 miles across country in it. He knew that only bad luck had prevented Latham from carrying off the prize, and that, if he himself were to win it, he had no time to lose.

For several days the winds were too high to allow an attempt, but at 2.30 a.m. on the morning of July 25th, Blériot, who had badly burned one foot in a petrol explosion, found the wound too painful to allow him to sleep, and so went for a motor ride. When he returned, he noticed that the wind had slackened, and realized that here was an opportunity which might not come again. Quickly he sent a message to his escort, the destroyer *Escopette*, and by 4.40 a.m. he was in the air, and heading out across the Channel.

At Latham's camp, M. Levavasseur had got up at two, and again at three, but had not considered that the conditions justified his waking Latham, who he knew to be very tired. Accordingly, Latham was not wakened until five, and then with the unpleasant news that his rival had already started. At once he ordered his own machine to be made ready, but before he could set out he received the news that Blériot had landed on the cliffs near Dover.

He was bitterly disappointed, but he sent a telegram to his rival, congratulating him, and saying that he hoped to join him shortly. Not to be outdone, Blériot immediately replied, sportingly offering to share his prize with Latham if he could get across that day. This Latham was only too anxious to do, but M. Levavasseur restrained him, for the wind had now risen again. Blériot had seized the only interval of calm in several days of storm.

Two days later the weather cleared, and late in the afternoon, Latham set out on his second attempt. The news of his departure was flashed to Dover, and forty thousand people gathered on the cliffs to see him land. When he was seen approaching, the ships blew their sirens while the great crowd cheered itself hoarse. But still luck was not with Latham. With success almost in his grasp, his engine failed him again, and his monoplane fell into the sea, almost at the foot of the Cliffs of Dover. So ended what has been called one of the magnificent failures of history. The Channel was not flown again until May, 1910, and again it was a Blériot monoplane—flown by Jacques de Lesseps—which did it.

Latham was at that most famous of all flying meetings: Rheims, August, 1909. Through his attempts on the Channel, fruitless though they had been, he had become famous, and his coolness and recklessness served to make him the idol of the crowds. He carried off the altitude record with a modest 508 ft, though he claimed to have reached over 1,000 ft. He also made a flight of 96 miles, though here he was beaten by Farman, who flew 112 miles, and he set up a record for the 100-km closed circuit, which he covered at an average speed of 42 m.p.h.

The success of this meeting inspired several others, and in October, 1909, two were held in England, at Doncaster and at Blackpool. Latham was at Blackpool. The time had been very ill-chosen, for the equinoctial gales were blowing, and for two days there was no flying at all. Eventually, as the crowd grew restive, Latham announced that he would take up his Antoinette. His fellow aviators endeavoured to dissuade him, for the wind was blowing at over 20 m.p.h. and gusting at up to more than forty. But Latham held to his plan, and with some difficulty got his machine into the air. Spectators and pilots alike watched him in horrified admiration, as his big monoplane circled the field, shivering in the cross-gusts, scarcely crawling against the wind, and sweeping down it at almost 100 m.p.h. Louis Paulham—who was later to win the prize for the London-Manchester flight—ran around wringing his hands, so great were his fears, and when Latham at last landed safely, there were tears in the eyes of his companions. It was a truly magnificent flight, and Latham was the hero of the meeting.

Latham continued his attempts on the height record, and by the end of 1909 had raised the world figure to 1,485 ft. He was now, beyond all doubt, the pilot of the year. He had learned to fly only in February, but his two great attempts on the Channel crossing, his magnificent rough-weather flying at Blackpool, and his repeated raising of the height record made him the darling of the crowds who attended the flying meetings.

End of a gallant endeavour: Latham's first Antoinette being salvaged from the English Channel. The pilot has been taken aboard the destroyer.

But 1909 was Latham's sole year, for after that he seems gradually to fade out of the picture. In January, 1910, he achieved the "vertical kilometre," with 3,281 ft, but he held the record for less than a week, when America captured it. He won the altitude prizes at Nice and Rheims, at the latter place raising the European record to over 4,000 ft; but this record, too, was soon taken from him, and by one of his old rival's machines, a Blériot monoplane, which went up to the then extraordinary height of over 10,000 ft. We find him competing in the Gordon Bennet race in New York, where he came in fourth, after having to make a protracted stop for repairs. Luck seemed never to favour him. Again it was his old rival's product that beat him, for the first and second machines were both Blériots, the first being flown by England's Graham White.

Latham was killed in 1912, though not, as he might perhaps have wished, in an aircraft. He was big-game hunting in the French Congo and, on June 7th, he was out on the banks of the Bari river, with only one native bearer. A rhinoceros attacked them and, when Latham fired at it, his rifle burst. Quickly he snatched another from his bearer, and with it killed the rhino. But no sooner had he done so than a buffalo appeared from some bushes and charged him. He fired at it, but only succeeded in wounding it, and, before he could fire again, the beast had reached him. He was tossed three times, and died almost at once. His luck had once more deserted him at a critical moment.

If you go along to the National Aeronautical Collection at South Kensington, you will see an Antoinette monoplane, the only complete one now in existence. That, and the lonely statue at Cap Blanc Nez, are almost the only links with Latham. Yet he came very near to achieving a real immortality. He had a fine aircraft, and almost perfect weather, but a little piece of wire brought him down into the sea. Blériot snatched at an uneasy period of calm, and even then his little engine grew desperately overheated, and would have brought him the same fate but for a chance shower of rain, which cooled it down again.

On such chances does fame depend, Blériot's name is still a household word, but I searched in London for three weeks before I found a person who had even heard of Latham. He did not succeed, and the world has no memory for anything short of success.

PIONEERING OUT BACK

"Taming the North." By Hudson Fysh. Angus and Robertson Ltd., Sydney, Australia, and 48, Bloomsbury Street, London, W.C.1. Illustrated. Price 15s.

THE 30th birthday of Qantas was greeted last year with a spate of historical articles in the world's aviation Press. Most of them mentioned that the first passenger on Qantas' first scheduled service was an 87-year-old Australian pioneer named Alexander Kennedy, who was flown from Longreach to Cloncurry by a young ex-Australian Flying Corps pilot named Hudson Fysh.

The story of how Kennedy revelled in the adventure of that flight, covering in a few hours the wild country across which he had battled for weeks with a bullock-cart many years earlier, is the climax of this biography of the old pioneer, written appropriately by his friend, Hudson Fysh. Preceding it is a record of courage and endurance which can rival in excitement any American "western". It tells how a handful of tough, determined men and women overcame the rigours of climate and terrain, and the enmity of the savage, primitive Kalkadoon aborigines, to found a rich agricultural state. They paid a high price in human life for their daring.

We tend to regard the settlement of Australia as a simple matter of building farmhouses and rearing thousands of sheep in natural sheep country. *Taming the North* gives the other side of the picture in a sincere way, with dashes of forthright Australian humour. It leaves no doubt of the extent to which Qantas, under the leadership of Hudson Fysh, and the famous Flying Doctor Service have been able to lighten the burden of the farmers of Queensland.

J. W. R. T.

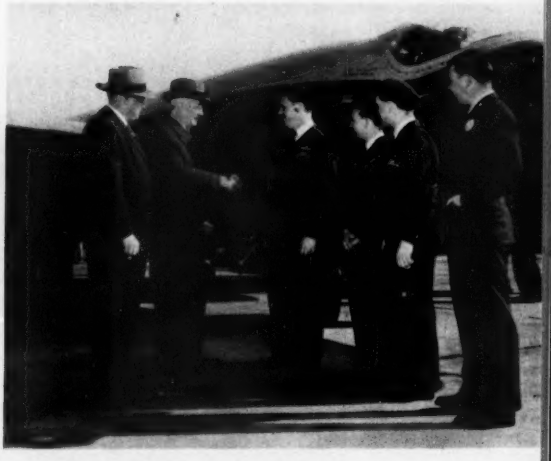
WORK-HORSES PULL TOGETHER

IN our issue of March 16th there appeared an account of a demonstration of co-operative air support by transport machines of the R.A.F. and U.S.A.F., dropping British personnel and equipment. Portrayed here in "Flight" photographs, secured on that occasion, are the two types mainly concerned: below, the Handley Page Hastings C.1, with four Bristol Hercules engines; top, the Fairchild C-82A, with two Pratt and Whitney R-2800 Double Wasps.

W/C. R. P. Beamont addresses the crowd at the Martin airfield on the occasion of his Canberra demonstration. With him are Governor McKeldin of Maryland; M. J. Birmingham, Commissioner of Baltimore County; C. C. Pearson, Martin president; H. D. Fazakerley, acting British Consul; and S/L. Callard. Below, Beamont (right) compares notes with C. C. Pearson and O. E. (Pat) Tibbs, Martin flight director.

BIG DAY AT BALTIMORE

Above: Sgt. S. W. Smith, an armament fitter, gives a small visitor a better look at the Canberra, as F/S. W. C. Slade, electrical fitter, "sells" Britain's pre-eminent light bomber, to be built by Martin.



Above, Glenn L. Martin, chairman of his company, welcomes S/L. A. E. Callard, D.F.C., to Martin airport a few days after Callard's transatlantic crossing in 4 hr 40 min. With him is C. C. Pearson, and, to Callard's left, F/L. A. J. R. Robson, D.F.C., signaller, F/L. E. A. J. Haskett, navigator, and W/C. Beamont, D.S.O., D.F.C.

Part of a crowd of nearly 20,000, composed of Martin employees, their families and guests, is seen on the left. Several hundred civic and business leaders of Maryland joined the Martin personnel in watching one of Beamont's classic performances.

DEVELOPED MAMBA

Modifications to a Sound Basic Design Increase Power by 25 per cent

FEW who read the first announcement of the Armstrong Siddeley Mamba on September 8th, 1946, could have fully appreciated how advanced and enterprising was the conception of this compact turboprop. All, however, must have been impressed by the frontal area and weight, which were remarkably small for a power unit giving in the region of 1,000 s.h.p. It was the first of the straight-through units with axial-flow compressor, and considering that relatively little was then known of the design and construction of axial compressors for aircraft gas turbines, the Mamba was most successful from the very beginning. Stepping-stones in its development career were the first flight in a test-bed aircraft on October 14th, 1947; the 150-hour civil and military type-test on February 21st, 1948; and the maiden flight of the Balliol—which thus became the first single-engined aircraft to fly solely on the power of a turboprop—on May 17th, 1948.

We cannot resist a digression here to quote some "popular" figures worked out in connection with the Mamba type-test. It seems that the turbine and compressor made 123,600,000 revolutions; each turbine blade travelled 100,000 miles at an average speed of 600 m.p.h.; and the engine swallowed 2,000 tons of air and 10,000 gallons of kerosene. The hours and conditions, expressed in terms of air miles in an appropriate aircraft, give an equivalent of twelve Atlantic crossings, or a return flight between London and Paris every day for three months.

Other development highlights for the Mamba include a 500-hour sealed endurance run, under A.R.B. supervision, completed on August 25th, 1948, and the first flight of the Apollo airliner with four Mambas on April 10th, 1949. It was at about the same time that full details were released of the Double Mamba illustrated overleaf. This unit has kept up the record of its individual "halves," and in June of last year became the first turboprop, as sole power unit of the Fairey 17, to land on and fly off an aircraft carrier. The Double Mamba was described in *Flight* of March 31st, 1949.

So much for general history and background. Inside the Mamba engine proper, development has been going on while flight and power plant experience has been gained. A most comprehensive review of improvements, and of teething troubles and their solutions, was given by Mr. W. H. Lindsey in his November, 1948, R.Ae.S. lecture on the development of the Mamba. In this he described a method employed and since adopted as standard practice to increase compressor throughput without major modifications to the engine. The question arose when, as is usually the case with aircraft engines, a need was felt for more power for certain prospective applications.

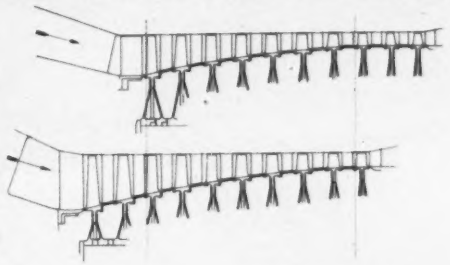
A considerable amount of compressor research by the Armstrong Siddeley company had led to the conclusion that the flow of air through the compressor could be increased very simply, without altering the stator casing, by removing the last two stages and replacing them, at the front end of the compressor, by two other stages with longer blades. After a few minor changes in angle, this was found to give very satisfactory results. It not only achieved the desired increase of 25 per cent in the mass flow, but also improved the compressor efficiency by 3 per cent (from 84 to 87 per cent).

On the basis of this simple alteration it was found possible to increase the power output of the Mamba by over 25 per cent without increasing either the overall diameter or the weight. Moreover, very little change had been called for in the major components. The original Mamba 2 incorporated this compressor modification, and it has been used for all subsequent aircraft applications, including the Double Mamba.

The special *Flight* drawing published with this article illustrates what may be called the 1951 version of the Mamba turboprop—the ASM.3. A data table is also provided. In addition to the alterations to the compressor, several other minor modifications have been made since the power unit was first described in *Flight* of March 18th, 1948.

So far as the compressor is concerned, the first three and last two rows of rotor blades are now of steel. The first three rows—including, of course, the two with longer blades—were altered to overcome a tendency towards aerodynamically excited flutters which would have led to fatigue failure, and also to provide a blade more resistant to erosion and to damage by small foreign bodies entering the air intake. These blades are mounted in aluminium-alloy discs by means of fir-tree-root serrations of the same form as those employed for the turbine blades, and the resultant combination of steel blades and aluminium discs came out no heavier than the aluminium blades and steel discs which they replaced.

The last two rows of compressor blades, referred to above, were changed to another material for a different reason; under extreme



Simple rearrangement of Mamba compressor to increase throughput

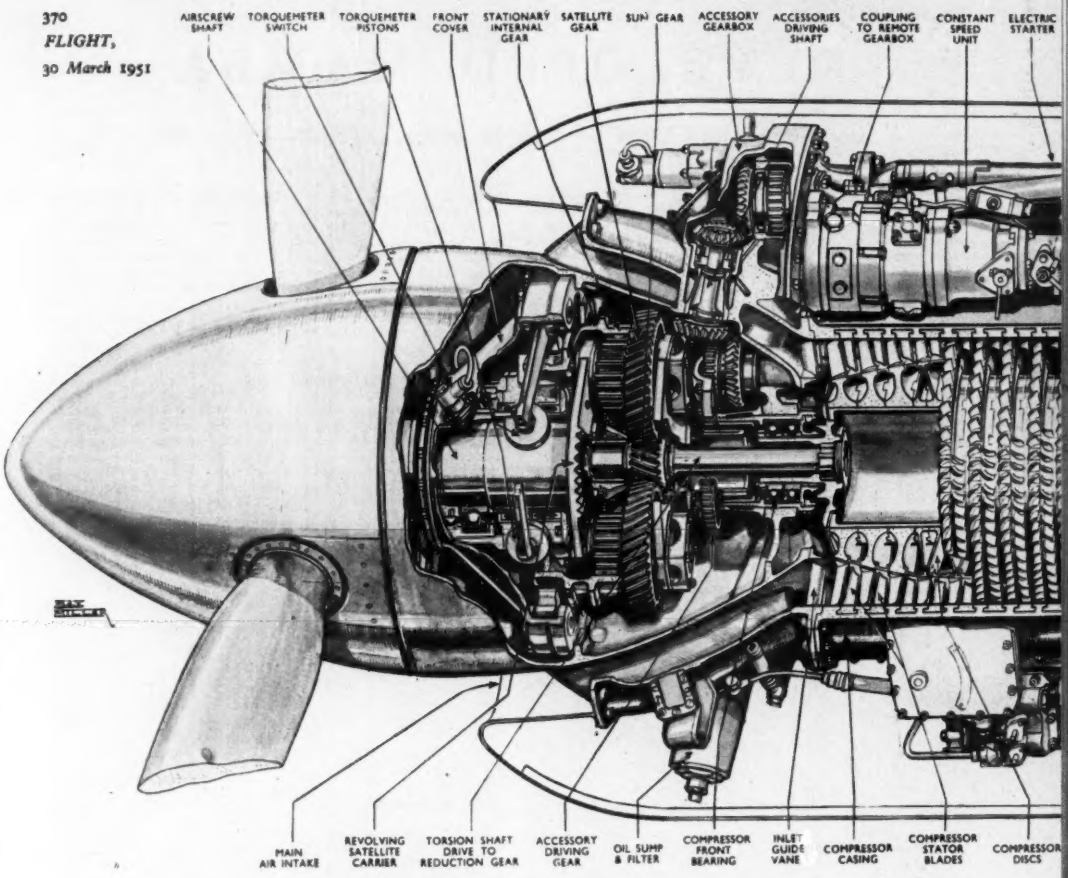
conditions the blades on the outlet end of the compressor were working near to the temperature limitation for aluminium, and it was therefore, considered desirable to provide a bigger safety-margin. Steel blades were, therefore, substituted.

The compressor stator casing has been cleaned-up by fitting the stator blade rings into grooves cut in the solid material of the casing itself instead of in grooves formed by bolting-in half rings as on early Mambas.

To preserve a proper balance of performance it was necessary to modify the turbine to suit the new compressor, and the desired result was achieved by the simple expedient of increasing the length of the blades—the discs remaining unchanged—and altering the stationary parts to suit.

In the course of normal development, modifications have also been made in the combustion chambers. One improvement has been to move the igniter plugs and spray jets from the side of the chamber into the nose. Flame propagation now takes place in a region of comparatively stagnant airflow, and it has been found

Most important installation of the Mamba is in the Apollo. The small diameter and clean enclosure of the power units are seen here to advantage.



DEVELOPED MAMBA . . .

possible as a result to relight at all conditions of engine and aircraft speeds so far encountered. Previously some relighting problems had been experienced at high air speeds.

Although only a cynic might be expected to recognize any association between deck landings and walking-sticks, another important modification to the Mamba's combustion chambers was, in fact, concerned with both. Colloquially, the primary air tubes in the Mamba's combustion chambers are known as walking-sticks and, following experience of Mamba or Double Mamba operation from the decks of aircraft carriers, it was found necessary to lengthen these tubes in order to meet a requirement for extremely rapid engine response to power-lever movements. In the same connection a system of control has been introduced which keeps the engine speed constant over the major part of the power range, and this in turn has meant that at low power the combustion chambers have to burn a much weaker air-fuel mixture than was previously the case. The modifications have enabled the requirements to be met without the mixture in the chamber reaching the extinction point on the weak side or, in other words, "without the fire going out."

Students of the Mamba will notice several other minor modifications shown in the latest cut-away drawing. It will be seen, for example, that the air-cooled centre bearing is now similar to that of the Adder, illustrated recently in *Flight*, a modification having been introduced to eliminate the complication of an extra scavenge line.

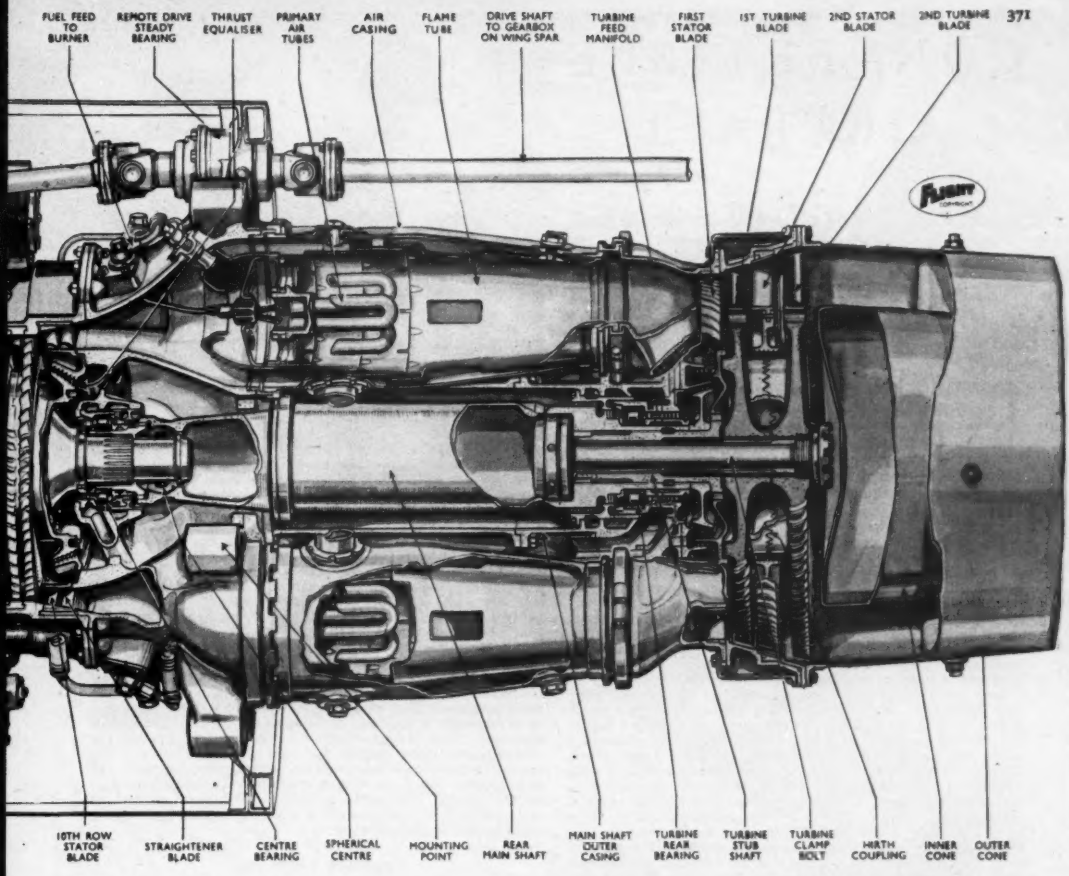
The aid of the Ultra Electric Company was sought in manufacturing a new type of micro-switch for the ignition cut-out governor and reverse-torque switch on the reduction gear. The equipment had been specially developed by Armstrong Siddeley. Another device produced by the same contractors to meet Armstrong Siddeley requirements is the jet-pipe temperature-control selector on the cam box. Its duty is to select a temperature to correspond with engine speed. In high ambient-temperature conditions fuel is bled-off by means of a Lucas solenoid bleed-valve controlled by a magnetic amplifier.

Among the accessories of the Mamba will be seen the latest Rotax Exp. 4112 starter, which has an increased output for the more powerful Mamba and can also provide the bigger power margin sometimes required for very cold conditions.

The Mamba drives a de Havilland airscrew (both three- and four-blade varieties have been tried out), and another accessory in the group on top of the compressor is the 711 constant-speed control unit.

Although a stage in the development of the Mamba has been reached at which it is appropriate to review progress, it should not be assumed that no more improvements can be expected. Work is, in fact, continuing on the basic unit, and flight experience under a variety of conditions is being obtained as rapidly as possible. Important current installations of the Mamba are, of course, in the Apollo, experimental Mamba-Dakota, Short S.B.3 and, in double form, in the Fairey 17 (ordered in quantity for the Royal Navy) and Blackburn Y.B.1.

Both in single and double form the Mamba's future is unquestionably bright for commercial and military installations. With substantial Service backing, five years' experience already behind it, and a fuel consumption figure already attractive yet still improving, it may well outstrip other turboprops in its class.



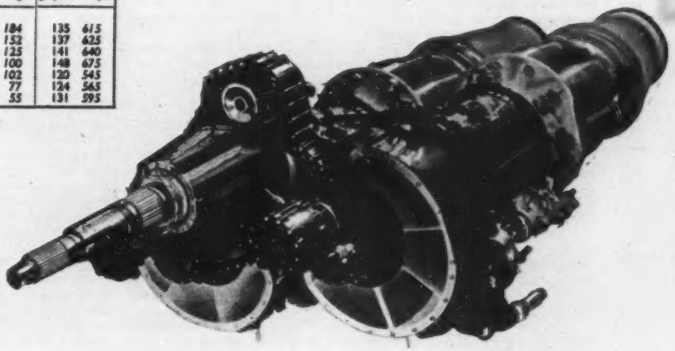
DETAILS of the construction of the latest Mamba ASM.3 turbo-prop are clearly shown in this "Flight" copyright drawing. Note the alterations in compressor construction and the modification to combustion-chamber design. The accessories also differ from those of earlier Mambas.

DATA FOR THE ARMSTRONG SIDDELEY MAMBA ASM.3

Maximum diameter over cowling	31 in (78 cm)
Overall length (rear face of airscrew to rear face of turbine housing)	57.8 in (147 cm)
Net dry weight (+2½ per cent)	780 lb (354 kg)
Jet pipe diameter	15 in (38 cm)
Air mass flow, sea level, static	18 lb/sec (8 kg/sec)

Performance at Sea Level

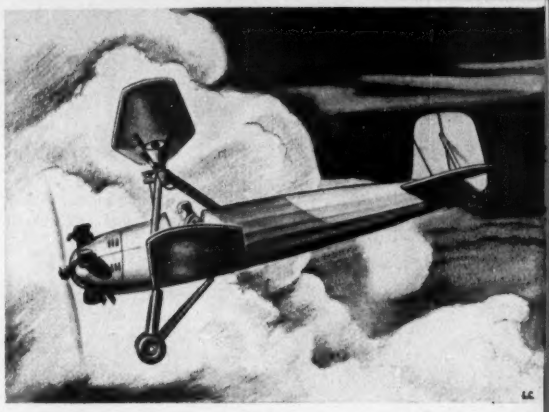
Rating	Engine speed r.p.m.	Aircraft speed m.p.h.	Aircraft speed km/hr	Shaft power h.p.	Shaft power c.v.	Net jet Thrust lb.	Net jet Thrust kg	Consumption gal/hr	Consumption l/h/hr
Max. take-off	15,000	0	0	1,320	1,340	405	184	135	615
Max. emergency	15,000	100	160	1,355	1,375	335	152	137	625
		200	320	1,440	1,460	275	125	141	640
		300	480	1,585	1,605	220	100	148	675
Max. cont. cruise	14,500	200	320	1,150	1,165	225	102	120	545
		300	480	1,270	1,290	170	77	124	565
		400	640	1,410	1,430	120	55	131	595



In the Armstrong Siddeley Double Mamba ASMD.1, two standard Mambas have been paired to drive two independent co-axial airscrews through a common gear casing and intake casting. The double unit produced 2,640s. h.p. and 810 lb thrust.

CONVERTIBLE AIRCRAFT

Capt. R.N. Liptrot's Lecture to the R.Ae.S. and the Helicopter Association.



The Herrick "Vertoplane" design appeared in 1937.

INTRODUCING his lecture on convertible aircraft at a joint meeting of the Royal Aeronautical Society and the Helicopter Association in London on March 17th, Capt. R. N. Liptrot, C.B.E., B.A., observed that it was fitting that the session should be a joint one, since the convertible aircraft in most of its forms attempted to combine features of the fixed-wing and rotary-wing types of aircraft. It introduced problems common to the two types.

Capt. Liptrot described the conver ible aircraft as an extremely controversial development. Fundamentally, it aimed at getting the best out of two worlds. The object was to create an aircraft capable of a speed range wider than either the fixed-wing or rotary-wing types could give in themselves. As the helicopter already flew at zero speed, the question resolved itself into a search for ways and means of raising the top speed of the helicopter or, speaking alternatively, of giving the conventional aircraft the landing and take-off qualities of the helicopter. Capt. Liptrot preferred to treat the subject from the former aspect.

Both the helicopter and the conventional aircraft had their own limitations. With the fixed-wing machine the price which had to be paid for higher operating speed was usually a higher take-off and landing speed, necessitating expensive runways—unless the higher speed was obtained by sheer horse-power. With the helicopter there were limitations mainly associated with tip-stalling on the retreating blade and compressibility effects on the advancing blade. Many of the limitations in both types of machine were being overcome, but the designer could not hope to escape all of them. The achievement of zero, or very low, minimum speed with very high operating speed could come only from the use of different principles at the two ends of the speed range. In attempting the combination care had to be taken that the two principles were not mutually incompatible and did not cause undue interference one with the other.

The idea of convertibility, Capt. Liptrot observed, cropped up in all branches of engineering. It was a favourite ground for inventors, but very few such ideas had any usefulness. In fixed-wing aircraft we had many times attempted convertible, or rather dual-purpose, types, but in every case with which the lecturer was familiar the severe compromises necessary had resulted in types which failed in their object. Indeed, the only successful examples which came to mind in any branch of transport were the submarine, the amphibian aircraft and the bed-settee! The lecturer's view was that the lower the degree of convertibility, the better would be the chances of success.

It might be asked why faster helicopters were wanted when controlled flight at zero speeds had already been achieved and helicopters could land on roof-tops, and when, time after time, it had been demonstrated that a helicopter flying at 100 m.p.h. was the fastest means of transport over stages of 250-300 miles. The truth was that operating speeds of the order of 100 m.p.h., such as were given by present-day helicopters, were not fast enough for airline operation where the block speed, in face of the most adverse head-winds likely to be encountered, largely controlled economics and determined the attractiveness of schedules. For these reasons the operating speed had to be raised and some of the forms of the convertible showed the way.

The possible configurations of rotating and fixed wings were legion, but they all fell under three headings. The first category considered by Capt. Liptrot was that in which the fuselage attitude was normal, whether in the low-speed or high-speed regimes of flight. There were several possibilities in this category, and these were successively dealt with by the lecturer.

The first was the extreme case in which fixed and rotating systems were provided, each sufficient in itself for one end of the speed range. This was a normal fixed-wing aircraft with a supplementary rotating system, operative only at take-off and landing. Such proposals involved too much added weight and drag, and reduced payload prohibitively. To reduce drag the rotors were usually arranged either to take up a trailing position when inoperative, or to be stowed away by retracting into a fairing. Alternatively, the blades could be made to telescope, so increasing the mechanical complexity still further.

A half-way house was the machine in which the supplementary rotating system was not big enough to sustain the aircraft in flight at zero speed, but contributed only a certain amount of lift, so reducing to some extent take-off and landing distances. Here again, rotor weight reduced payload and the rotor had to be retractable or have telescopic blades. In some proposals of this kind the rotors were carried in holes in the mainplane. They reduced the effective area of the mainplane and were so small that their lift contribution was of no great value. They could be driven as helicopters or simply allowed to autorotate.

The third configuration in the first category considered by Capt. Liptrot was that in which a two-bladed rotor was stopped and locked athwartships to become a fixed wing. Very often there was a permanent fixed wing, so that the conversion was a biplane. Most proposals of this kind had a separate propulsive means for high-speed flight though, where the rotor was jet-propelled, the blade-tip jets might become the main propulsive means. The method involved rotating one blade through 180 degrees in the jet-propelled version, or when normal aerofoil sections were used for the blades. This added complication could be avoided by using aerofoils of lenticular shape when the leading and trailing edges became interchangeable.

Fourteen Years Ago

Historically this type of aircraft was interesting, since in 1937 Herrick, an American, demonstrated his conversion in the air on his "Vertoplane." This was a biplane with normal tractor airscrew, in which the upper wing could be released and operate in autorotation as a gyroplane rotor. The aircraft took off as a biplane, could cruise either as a biplane or as a gyroplane, and was landed as a gyroplane. The conversion in the opposite sense from gyroplane to fixed wing was never accomplished. Herrick developed a double-purpose symmetrical aerofoil which proved to be reasonably efficient in both regimes of flight. He was still advocating what was basically the same type and was currently engaged on the design of a new aircraft in which helicopter take-off and landing were provided by driving the rotor with jets at the blade tips. The controls were quite conventional and operated in the same way in any regime of flight, except that a separate collective-pitch control was provided for flight as a helicopter.

The process of take-off and conversion was to take off as a helicopter, with the jets operative, then after vertical climb to a convenient height the stick would be moved forward to accelerate to some 40 m.p.h., when the conversion lever would be moved to the gyroplane position. Automatically the tractor airscrew would "rev up," the jets would be shut off, and the rotor blades set at the angle for autorotation. The aircraft would then be flying as a gyroplane. When a speed of about 70 m.p.h. was reached, the conversion lever would be put into the "plane" position, automatically the rotor would slow down, stop, and then reverse for not more than half a revolution, when the locks would come into operation and the rotor would become a fixed wing. The landing conversion would be effected in the reverse order, the jets being automatically relit prior to the final deceleration to hovering and touchdown.

The next configuration considered was that in which the rotor(s) were rotating in a substantially horizontal plane for

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CONVERTIBLE AIRCRAFT . . .

take-off and landing and were rotated through 90 degrees, either alone or with the fixed wing, for high-speed flight. In most of the projects put forward two rotors were disposed laterally near the tips of the fixed wing. An alternative which had been proposed was to have an intermeshing twin-rotor group at the nose of the fuselage. The engine, with transmission and rotors, was carried on a trunnioned mounting and the whole assembly swung through 90 degrees during conversion. In this category the rotors became the airscrew for cruising flight and the same problems were presented as were discussed in connection with the second category.

Capt. Liptrot then referred to the remaining type in his first category—that in which the rotors continued to operate as helicopters in all regimes of flight but were progressively unloaded as forward flight increased, by means of a small fixed wing. It might be argued that in putting this forward the lecturer was begging the question, since it was not a "convertible" at all but simply a composite type consisting of a normal helicopter to which a small wing had been added. Such use of a small wing, however, was capable of extending the speed range of a helicopter to a very considerable extent, and was legitimately within the scope of the paper. Indeed, Capt. Liptrot was going to argue that this was the logical and radical way of improving helicopter high-speed performance. Moreover, it satisfied his dictum that the less the degree of convertibility the greater the chance of success in achieving the object of convertibility—to improve the high-speed performance of the helicopter.

There were two fundamental factors which operated to limit high flight-speeds on the helicopter. The first was that of compressibility effects, since very high speeds were encountered at the tip sections of the advancing blade. Frankly, we did not know the limiting Mach number to which we could go without risking any severe rise in profile drag power; but so far most helicopter designers, accepting high-speed-aeroplane evidence, had put the limit at about 0.8. The high Mach number, however, was experienced only over a small part of the rotor disc and under conditions where the blade-section lift coefficient was low; so perhaps a somewhat higher figure than 0.8 could be accepted. Personally, Capt. Liptrot had tentatively used 0.83.

The second factor limiting high flight-speeds was tip-stalling on the retreating blade. The parameters which were decisive in determining when tip-stalling commenced, other than the blade aerofoil characteristics, were the tip-speed ratio and the aerodynamic blade loading C_T/σ. (C_T was the thrust coefficient defined by $\frac{\text{thrust}}{C_T = \pi R^2 \rho (\Omega R)^2}$. R was the rotor radius and ΩR the tip speed. σ was the solidity, defined as the ratio of total blade area to disc area.)

Tip-stall Effects

The higher the tip-speed ratio, the more severe the tip-stall encountered. This was due to the fact that for rotors with hinged (or see-saw) blades the automatic equalization of lift between advancing and retreating sides of the disc led to an increase in blade angle-of-attack on the retreating blade. The blade angles were also influenced by the drag characteristics of the helicopter, since the greater the parasite drag the greater the tilt of the disc necessary to provide the propulsive component of the thrust for forward flight, and therefore the greater the blade collective pitch which was necessary. The aerodynamic blade loading parameter was proportional to the rotor-blade loading, and inversely proportional to the square of the tip speed. It was a measure of the mean blade-lift coefficient, and obviously the blade stall at increasing flight speeds was more severe the higher the aerodynamic blade loading.

There was only one report (N.A.C.A. Tech. Note No. 1083 by Gustafson and Myers) which gave any guidance as to the maximum blade-angles permissible before the ill effects of tip-stalling in vibration, and impairment of handling qualities, became intolerable. The conclusions from flight tests were that the effects of tip-stalling began to be noticeable at retreating-blade angles 12 deg above the low-lift angle, and became too severe to permit flight at 16 deg. For the purposes of his paper the lecturer had assumed that 13 deg would be tolerable for an airline helicopter. Perhaps the best way of showing how the parameters were related was to plot the rotor C_T/σ necessary to obtain the desired limiting tip blade-angle at any tip-speed ratio, the influence of parasite drag being shown by plotting a family of curves against μ, each curve being appropriate to an assumed value of D/L, the parasite drag/lift ratio at the operating speed corresponding to each point on the curves. The lecturer had worked out the theoretical relationship between C_T/σ and μ to give his assumed limiting blade-tip angle of 13 deg (see graph).

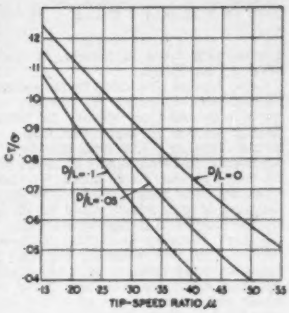
Of the three drag curves, that for D/L 0.1 was representative of the high-drag helicopters now in use, while that for D/L 0.05 might be taken as representative of the next generation of aerodynamically clean helicopters.

Theoretical blade-tip-stalling curves for blade angle-of-attack of 13 deg; based on rectangular, untwisted blades and uniform flow; good blade-finish. The general equation of these curves is below.

$$1-(0.8+4\,{}^{D}/_{L})\mu=2.5\sqrt{C_T/\sigma}$$

where $^{D}/_{L}$ *is the parasite drag/lift ratio at the operating speed. In terms of operating speed, tip speed and blade loading* $\left(\frac{W}{\sigma}\right)$*, the corresponding equation is:*

$$(0.8+4\,{}^{D}/_{L})\ V \text{ limiting ft/sec.} = \Omega R - 51.4\sqrt{\frac{W}{\sigma}}$$



The curves showed how decisive C_T/σ was with respect to tip-stalling, and in particular how rapidly the operating C_T/σ must be lowered with increasing speed to maintain the same retreating blade-tip angle.

As was well known, the optimum hovering performance of a lifting rotor occurred at a value of C_T/σ of 0.1, and if reasonable hovering performance were to be maintained C_T/σ could not be reduced much—certainly not below 0.07.

The problem of raising the high-speed performance of a helicopter resolved itself largely into finding means of reducing C_T/σ appreciably in forward flight as compared with the hovering value, and of reducing rotor-tilt. The lecturer referred to two available means. The first was the gyrodyne principle of putting part of the power available into a propulsive screw(s). This was, in effect, equivalent to reducing the drag of a helicopter to a negative value. It was very effective in raising the operating speed as limited by tip-stalling. We might expect to raise the limiting tip speed to something like 0.45 at a C_T/σ of 0.07. As the limiting tip speed for advancing-blade Mach number 0.83 was about 620 m.p.h., this corresponded to a limiting operating speed of 190 m.p.h.—a very considerable advance over anything available to-day.

The second means referred to by the lecturer was the use of small fixed wings. The radical way to lower the C_T/σ for high-speed flight, while keeping efficient values at the low-speed end of the range, was to add a small wing to take over part of the lift in forward flight and so progressively unload the rotor and lower the operating G with increasing forward speed. Some recent design studies showed that operating speeds of 200 m.p.h. were quite possible by adding a fixed wing only 3 per cent of the rotor-disc area. There was a limit to the amount of fixed wing which could be added, since the unloading of the rotor meant that it must be tilted further forward to provide the thrust component. The lecturer had not yet completed his investigation, but preliminary work indicated that up to 6 per cent of the rotor-disc area could be used. Moreover, the gyroplane principle could still be used effectively with small wings, and there was not the same limitation on the amount which could be employed, since the rotor was never tilted appreciably. So far as the investigation had gone, it showed that a gyrodyne with 6 per cent fixed wing would have a limiting speed of about 250 m.p.h.

Fixed-wing Advantages

It was clear that the combination of the helicopter with a small fixed wing was a relatively simple, but extremely effective, device for raising the operating speed of the helicopter, and made any real convertibility quite unnecessary—at any rate where speeds of the order of 250 m.p.h. were satisfactory, as they were for the relatively short-range airliner. The lecturer was of the opinion that from now onwards every helicopter design should have small wings, or at least provision for adding them during development, since the advantages which they conferred were so outstanding. Analysis of the overall aerodynamic efficiency of the pure convertible of the type when the rotor was turned through 90 degrees to become the airscrew, and of the gyrodyne with fixed wings, showed that the convertible could only have a small advantage—of the order at most of 10 per cent, in limiting speed. It paid heavily for this small advantage in its greater complexity.

The helicopter with a small fixed wing was being exploited by the Gyrodyne Company of America. Their prototype had a gross weight of 7,600 lb and a bare weight of 4,650 lb, and had a small fixed wing of 26ft span and 75 sq ft area. It had two co-axial contra-rotating rotors, each 52ft in diameter, driven by two Lycoming engines each developing 375 h.p. It cruised at 150 m.p.h. at 5,000ft on 608 h.p. Under these cruising conditions the wing

CONVERTIBLE AIRCRAFT . . .

was carrying 2,500 lb. weight, so that the rotors had only to develop 5,100 lb lift.

Capt. Liptrot now came to the second main category of convertible—that in which the aircraft was postulated as taking off with the fuselage vertical, the whole aircraft being rotated through 90 deg for high-speed flight. There were two classes in this category. The first considered by the lecturer had a permanent fixed wing to give necessary lift in horizontal flight, and the rotors became the airscrews. The major difficulty in all cases where the rotor became the airscrew after conversion was that of designing a rotor which would be efficient both for vertical lift and for propulsion in high-speed flight. The lecturer pointed out that high efficiency in vertical climb was associated with high solidity, light power-loading and light disc-loading. The latter demanded large diameter, while in horizontal flight high propulsive efficiency demanded low solidity and small diameter. In other words, the rotor size for good helicopter performance was too large for best efficiency in horizontal flight. In order to avoid the additional complication of variable gear ratio in the rotor drive it was also desirable to have substantially the same rotor speed in all flight conditions. A compromise was necessary to keep the C_T/σ as high as possible for helicopter flight and as low as practicable for horizontal flight, and a severe loss in propulsive efficiency was inevitable. This loss tended to increase very rapidly with increasing forward speed, particularly in the absence of a variable gear-ratio, and the selection of rotor diameter was a matter for intensive study. For reasonable propulsive efficiency the rotors must be primarily airscrews, with much higher disc-loading than was customary for helicopter rotors, and some other expedient must be adopted at the low-speed end of the range. The solution devised by Zimmerman was to use an all-wing aircraft of aspect ratio close to unity, with two rotors bathing the whole wing in slipstream, so exploiting the high lift developed at high incidence by low-aspect-ratio aerofoils as well as the lift due to the slipstream at low forward speeds.

Capt. Liptrot next referred to a type of machine in which the rotor was stopped to become a fixed wing on conversion. In this case either a separate propulsive means must be provided, or the rotor must be jet-propelled, in which case the jets could be the propulsive means.

Yawed-airscrew Power

The lecturer then came to his third main category. He remarked that his survey of the usual configurations for convertible aircraft had shown that except, perhaps, Zimmerman's low-aspect-ratio type, they could not be expected to achieve much more than the 250 m.p.h. which was within the promise of the relatively simple addition of a small fixed wing to an otherwise conventional helicopter. For some Service roles—particularly for fighters for operation from the decks of ships, where higher and higher performance was demanded while deck limitations remained the same—a high-performance convertible would be most attractive, and there was one form of convertible for which a case could be made. This used the side force experienced by a yawed airscrew. It was a well-known effect, and all designers took due account of it when calculating the required fin area for a new type. To use this side force as the prime means of lift was, however, something quite new in aviation. The aircraft using this principle was of the tilting-fuselage type with jet-propelled rotor, or rotors, of reasonable diameter and high solidity. With such a type in the horizontal position the combination of large-diameter blades and high pitch resulted in considerable side projected area, and with the aircraft at small angles of pitch the rotor would create enough lift to sustain the aircraft. This principle was first put forward by Holst in Germany and was used towards the end of the war by Kurt Tank, the chief designer of the Focke-Wulf company, as the basis of the design of a novel high-speed fighter. This aircraft was to have a three-bladed rotor of 37.4ft diameter driven by ramjets at the blade tips, the total blade area being 179 sq. ft. The machine was to weigh 7,000 lb empty, have a gross weight of 11,400 lb, and the estimated maximum speed was to be 620 m.p.h. at sea level.

This would appear to be one line of development where the rotary-wing type could approach the high-speed performance of the modern aeroplane while at the same time giving vertical take-off. The possibility of such an achievement gladdened the heart of the deep-dyed rotary-wing enthusiast but, observed the lecturer, in spite of his having been the most persistent advocate of the helicopter for more years than he cared to remember, he was going to be a thorough renegade and "hand it on a plate" to his "conventional aeroplane friends" by suggesting to them that they could themselves do just as well. Some of their jet-propelled high-speed fighters in the 600 m.p.h.-plus bracket already had a thrust/weight ratio better than unity, so that with a tail undercarriage they could, in fact, take off vertically. Of course they would have some pretty problems as regards stability in vertical flight, and they could never land vertically in the event of power-unit failure. In aviation, however, the impossible always became reality sooner or later, and perhaps the really high-performance convertible might come about in this way.

At this point the lecturer remarked that many aspects which he had had to leave out of his paper were, in fact, the very ones on which the eventual practical convertible must rest. He indicated two of them. The first concerned safe landing in the event of power-unit failure, which was imperative. This accentuated the problem of designing a rotor which would be efficient as an airscrew, since the disc loading must be low enough to permit a safe auto-rotational glide with a low enough rate of descent.

In those cases where the rotors became the airscrew, there was a parallel problem to that of power failure in the helicopter proper. If power failed in horizontal flight, during conversion of the rotors back to the condition with axis vertical, they must pass from operation with the air flow down through the rotor disc, through the windmilling zero-torque condition, to the other zero-torque condition—that of autorotation where the airflow was upward through the disc. During the transition from one type of flow to the other there was a period where there was a decelerating torque on the rotor, and the question arose whether the rotor axis could be traversed quickly enough, and the autorotative state established, before the rotor slowed down too much, and without the negative thrust becoming so large that the wing was excessively loaded. This question would have to be carefully considered, particularly where the rotor axis itself was rotated through 90 deg. The annular rate of movement from horizontal to vertical would have to be such that the whole change could be completed within two or three seconds, and as the main power unit was no longer available, a separate power source would have to be provided for emergency conversion.

The second problem was that conversion must take place in a progressive and continuous manner without any loss of lift on the aircraft as a whole, and no abrupt aerodynamic transitions could be tolerated. Throughout the whole transition period the aircraft must continue to be stable and under full control, and the controls must continue to have the same response throughout all the phases.

One point which would have to be carefully considered was that, whether or not the rotors were used for lift in horizontal flight, the lift and side forces would be present in greater or less degree whenever there was any pitch or yaw, and if the rotors and tail surfaces were not properly proportioned and located the aircraft might become unstable in the high-speed condition.

An interesting point was disclosed by N.A.C.A. tests on the Zimmerman low-aspect-ratio type. Here the aircraft was definitely unstable with rigid rotors. Articulated rotors gave a stable slope to the pitch-moment curves, but the tail controls were not powerful enough to trim at the very high angles of attack associated with high values of lift coefficient. The remedy was a large trailing-edge flap used as an auxiliary longitudinal control. This flap was necessary in any event because of the pitch-moment introduced by ground interference during landing and take-off.

More Research Necessary

Except for the N.A.C.A. research on the Zimmerman type, little had been done systematically to explore the many problems of the transition stage, and most inventors had simply described their aircraft in the two operative configurations, assuming that the conversion could be effected instantaneously, as though one had only to pull a lever or press a button. Unfortunately it was not so simple as that, and much research appeared to be necessary before we could be assured of securing a completely satisfactory conversion.

Capt. Liptrot's personal conclusions were that, at any rate for airline or other operations, where an operating speed of 250 m.p.h. was satisfactory, the true convertible had little merit over the helicopter with small fixed wings. It had to be remembered that the helicopter was essentially a means of transport over relatively short distances. The convertible was not so attractive for long stages, since its overall efficiency must be lower than that of its fixed-wing counterpart, and the price paid to improve the take-off and landing would reduce the benefits otherwise obtained from convertibility directly as the stage length. Mr. Shapiro had said recently that for long-range operation the logical way to convert was on the ground—i.e., the conversion should be effected by transferring the passengers at the main inter-continental airport from the fixed-wing airliner to the feederliner helicopter. In this way the helicopter would be used in its proper role as complementary to, and not superseding, the fixed-wing type of aircraft.

For very high-speed Service duties the driving-wing principle would appear to be the only one likely to provide a practical solution.

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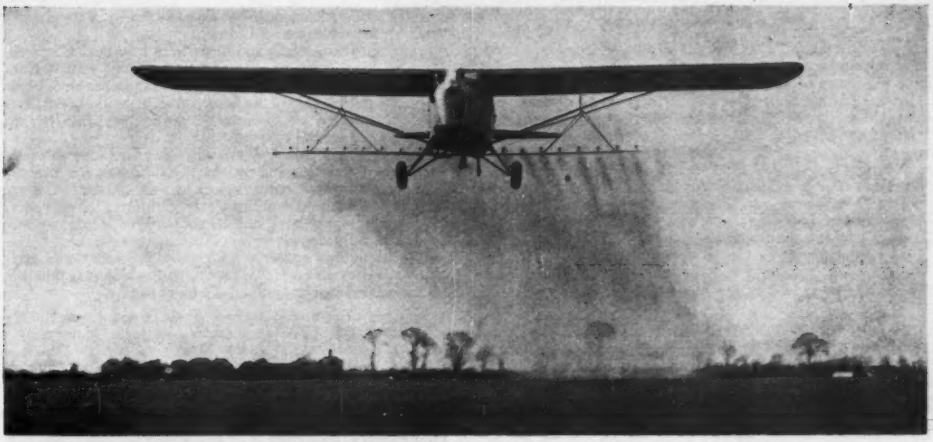


PROTECTIVE AIGLETS

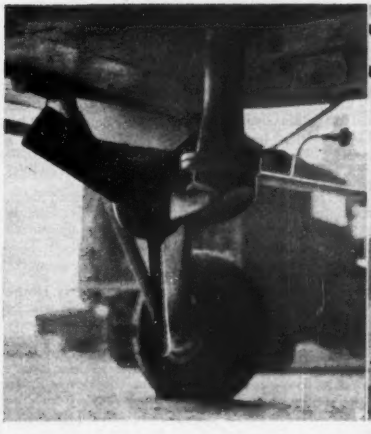
Latest Equipment Used for Successful Spraying in the Sudan

AT Boston airfield, Lincs, on March 20th, a demonstration of crop-spraying by fixed-wing aircraft was staged by Aerial Spraying Contractors, Ltd., in collaboration with Auster Aircraft, Ltd., and Shell. The Auster company took the opportunity to advance the claim that a long period of experimental and operational spraying with their aircraft has proved that these machines, and the spraying equipment fitted, are "completely successful." The costs, it is claimed, are far below those of the helicopter and, for all but very small individual acreages, are even lower than for ground machinery. So far as can be determined by the company, the crop-spraying Auster is superior to anything available in America, where the technique has been developed to a very high pitch and on a vast scale.

The most important operation undertaken (and, incidentally, one of the biggest attempted outside North America by fixed-wing aircraft) was in the Sudan, during last October and November. Three Aiglets, owned by Aerial Spraying Contractors, Ltd., of Boston, Lincolnshire, were flown out to Khartoum, the 3,200-mile journey being completed in 34 flying hours, spread over ten days. On arrival the Aiglets undertook the spraying of 17,000 acres of cotton against cotton jassid, a pest which is difficult to control since the effective spraying period is short and the insect lives and feeds entirely on the undersides of the leaves.

The Auster company states that doubts previously expressed as to the ability of the spray from fixed-wing aircraft to reach the underside of foliage were quite dispelled by the operation, the success of which was proved to entomologists who examined and reported on the results. Agricultural

The uppermost view is of an Auster Aiglet (Gipsy Major 1 engine) demonstrating the low-altitude spraying technique referred to on this page. Of the details below, that on the left is of the Aiglet's airscrew-driven pump and spraying nozzles; the second close-up shows the port section of the spray-bar and nozzles. The spraying equipment was designed by Mr. P. C. Andrews, of Aerial Spraying Contractors, Ltd.



PROTECTIVE AIGLETS . . .

experts of the Royal Dutch Shell Group, who made a major contribution to the project, were among the pioneers in this method of crop protection.

Seventeen thousand acres were widely sprayed along both sides of the White Nile, about 100 miles south of Khartoum, over a distance of 120 miles and in plots varying from 30 acres to 3,000 acres. These areas in turn consisted of fields varying in size from five acres to 200 acres, the average being 75 acres. The average area covered during each spraying hour was about 70 acres, the deposit varying between two and four gallons of liquid, applied from a height varying between six and 15ft, depending on weather.

On one occasion 280 acres were sprayed in 15 min, the Aiglets operating from a landing strip adjacent to the crop. So efficient was the ground organization and filling equipment that the turn-round from "wheels on" to "wheels off" averaged only a minute and a half.

Trees, telephone wires and birds were among the hazards. Flocks of birds were encountered, ranging in weight from two oz to 14 oz for each bird, and there were single birds of up to ten lb or more. One of the latter struck the windscreen of an Aiglet but caused no damage whatever—probably having been dissected by the airscrew.

The special spraying equipment to give the range and output achieved was designed by Mr. P. C. Andrews, a director of Aerial Spraying Contractors, Ltd. It consists of a retractable windmill-driven pump connected to a 48-gall tank, and a double spray-bar beneath the wings. The gear was fitted, and fully approved by, Auster Aircraft, Ltd. The ground-filling unit, specially designed to pre-mix the insecticides, embodies a Lee-Howe pump, with which it is possible to fill the aircraft spray-tank in about 25 sec.

EXTRUDED AIRSCREW - BLADES

ASSOCIATED for many years with the development of the metal airscrew and welded hollow-steel blades, the propeller division of Curtiss-Wright Corporation now announce a successful conclusion to two years of experimentation in producing hollow blades by extrusion. Working in conjunction with the airscrew laboratory of Air Matériel Command at the Air Force Development Centre, Adrian, Mich, the Curtiss-Wright engineers claim to have carried the new process "well beyond the experimental stage," and production arrangements are being planned.

As is so often the case with initial news-releases by American manufacturers, authoritative technical details are lacking, but it would appear that the process begins with the extrusion, through suitable dies and at white heat, of a 400-lb chrome-nickel-molybdenum steel billet; a 5,500-ton press is employed.

The blade emerges as a seamless tube of tapered wall-thickness and circular cross-section, and with a flange running from root to tip on each side. In subsequent operations the tube is partly flattened and formed between dies to the required blade-section, the flanges then being machined into leading and trailing edges; the normal finishing processes follow. Before the machining operations, it is stated, the tube for a 10-ft blade weighs 200 lb, as compared with the 750 lb of an orthodox hollow blade at the same stage of manufacture. The blades are being made with the now widely adopted rectangular tips.

The billet, the extrusion and the finished blade. Francis O'Leary, general manager of Curtiss-Wright propeller division, stands by to give them scale.

Escapism—and Why Not?

"*Flight of Fancy.*" *By James Riddell. Robert Hale Ltd., 18, Bedford Square, London, W.C.1. Illustrated. Price 25s.*

BY a rare stroke of good fortune, we recently received a copy of *Flight of Fancy* at the same time as the inevitable 'flu. No finer tonic could have been prescribed. Within a very few minutes we were airborne in Proctor G-AKIW (*Item Willie*), bound for the romantic and sunny East, with no less a person than Nevil Shute at the controls and with James Riddell to provide a fascinating, very human commentary on places and people of interest *en route*.

Soon Britain and Fill-dyke February were far behind as "the lovely panorama of the French Riviera and the Italian Riviera floated by below us in the sunshine. We circled the town of Pisa, and the Leaning Tower stood straight while the rest of the world tilted to impossible angles." On to Rome, Naples, "which we saw and did not die," Brindisi, Corfu and Athens, where Mr. Riddell first introduced us to his dreams; they were scarcely more remarkable than the 30,000-mile, six-month journey to Australia and back that lay ahead of us. Never a complaint from *Item Willie's* gallant little Gipsy Queen as Cyprus, Lebanon, Syria and Iraq were left behind; then India, Burma and on to Bangkok, Singapore, Indonesia and Bali, to which we—especially Mr. Riddell—had been looking forward eagerly for 108 pages.

We landed. "Nothing but palm trees all around. Formalities? What on earth for? Is not this Bali? Drove the ten miles to Denpaser through flat but delightful countryside—palm groves, padi fields—cows with wooden bells round their necks—villages with palm-leaf houses—temples—carved stone statues of Gods—happy Balinese faces—and, of course, bare-breasted girls in sarongs . . ." Before long we were introduced to the weird and beautiful ritual of trance dancing, a Belgian Gauguin and his lovely wife Polak, child Changer dancers, mysterious "looking disks"—part of the lost magic that used to be understood when the East was as young as the West—and scores of other fascinating sights and sounds.

This is a book to make one forget wars, rumours of wars, rationing and all other fruits of modern civilization. It certainly made us forget our 'flu, and is worth buying for the 69 superb illustrations alone. J. W. R. T.

Next R.Ae.C. Film Show

THE next film programme to be given at Londonderry House for members and associate members of the R.Ae.C. will be on April 18th at 6.15 p.m., when three films will be shown. They are *Pegasus*—the story of the Airborne Forces; *Air Beef*—the "meat-lift" operated by Australian National Airways (an article on this subject, incidentally, appeared in last week's issue of *Flight*); and *Supermarine*—covering the development of Supermarine and Vickers-Supermarine types from the Schneider Trophy seaplanes to the 510 jet fighter.

CIVIL AVIATION

JETLINER PROGRESS: A pleasing new view of the Avro Canada Jetliner, which has now almost completed its programme of performance testing. The manufacturers hope that the Jetliner—which, when developed, will operate economically over stage lengths of up to 1,100 miles—will go into commercial service next year. Capacity is provided for 40/60 passengers and cruising speed will be approximately 450 m.p.h.

THE second reading of the Consolidated Fund (No. 2) Bill, which took place in the House of Commons on March 19th, was made the occasion for a comprehensive debate on the present state of civil aviation in the United Kingdom. The debate is referred to in a leading article on page 357 of this issue, and we hope to include in *Flight* next week a full report of the many interesting points which were raised during the discussion.

The considerable operating deficits incurred to date naturally brought the State-owned Corporations under fire from the Opposition, whose general opinion was that, although good progress is undoubtedly being made, when considered in relation to the results of foreign operations, British achievements give little cause for satisfaction. It is considered that the Corporations' costs are still too high and over-staffing is pointed out as being one of the main reasons for this.

Other points touched on during the debate included the question of whether the fact that the Corporations undertook charter flying constituted unfair treatment of the independent operators, the problems of the Princesses and the Brabazon, traffic capacity at London Airport and provision of Fido at certain airfields. Points were also raised in connection with mail subsidies for the Corporations, which are said to compare very unfavourably with those paid to certain foreign operators, particularly those in the United States. Also mentioned was the future of Prestwick airport; on this question the opinions of Scottish authorities were said to be unanimous in their demand that Prestwick should be developed as a major international airport.

THE SOUTH PACIFIC SURVEY

AT the time of going to press the latest news of the important Pacific survey flight now being undertaken by Capt. P. G. Taylor, G.C., M.C., was that his Catalina had landed at Papeete Harbour, Tahiti, thus completing the fifth stage of the 8,000-mile journey. Though the flight is sponsored by the Australian Government and has no connection with any commercial concern, Capt. Taylor's intention is to pave the way for a regular Australia-South America service and thus fill-up one of the few remaining gaps in the network of international air routes.

Nine months of patient organizing were necessary before the flight could be made. Fuel had to be made available at several points where no regular supplies existed. The flight is being made in seven stages: Sydney to Noumea (New Caledonia), 1,070 miles; Noumea to Suva (Fiji), 781 miles; Suva to Satapuala Bay (Society Islands), 780 miles; Satapuala Bay to Papeete (Tahiti), 1,400 miles; Papeete to Mangareva (Gambier Group), 900 miles; Mangareva to Easter Island, 1,400 miles; and Easter Island to Quintero Air Base (Valparaiso), 2,000 miles.

The experience of a Chilean Air Force crew, who recently flew a Catalina from Valparaiso to Easter Island, induced Capt. Taylor to have his own aircraft fitted with Jato rockets. With most of its fuel gone, the Chilean aircraft landed on a small grass strip. For the return flight it was loaded with fuel and put in the sea, but failed to take off; and the crew had to return to Chile by surface transport. The four rockets fitted to Capt. Taylor's Catalina weigh, in all, about 200 lb and give added thrust equivalent to 400 h.p.; they are fired electrically, after the throttles have been fully opened. The procedure is to fire one rocket on each side simultaneously and then fire the other two so as to overlap the thrust of the first pair. By this method take-off run is reduced to about half the normal distance. The Jato equipment should be particularly useful at Easter Island, where take-off has to be made from open sea.

CAUSE AND EFFECT

A CLASSIC example of how, in the operation of an aircraft, a serious accident can result from circumstances which are normally harmless is to be found in a recent Accident Prevention bulletin, issued by the Flight Safety Foundation, New York.

During an airliner's final approach, the report states, an important electrical circuit suddenly became energized; the reason was that the contacts of the relevant relay switch closed because the natural vibration frequency of the relay happened to accord with that set up by the aircraft when landing.

In cases where relays are used for airscrew-reversing systems, fuel shut-off valves or fire extinguishers, such an occurrence could clearly lead to a serious mishap. A suggested method of preventing such an occurrence is the fitting of relays whose natural vibration-frequency is not likely to be a harmonic of that set up throughout the airframe; or the relays might be dynamically balanced so that contact points could not be closed inadvertently. Alternatively, it is suggested that the use of relays should be discarded entirely—a practice which was, in fact, adopted by the airline on whose aircraft this unusual fault occurred.

MARTIN 2-0-2s WITHDRAWN

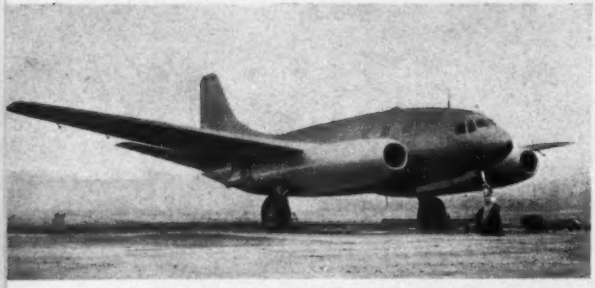
NORTHWEST AIRLINES, a large American internal operator, has taken its fleet of 20 Martin 2-0-2s out of service in order that modifications recommended by the C.A.A. may be carried out. The airline has stated that the modifications are the result of investigations made by the board appointed by the C.A.A. some time ago. This board was given the task of deciding whether any basic shortcomings of design contributed to the numerous accidents in which 2-0-2s have been involved during the past two years. The board found no basic shortcomings and did not recommend any structural changes.

Northwest's 24 Martin 2-0-2s will be replaced, temporarily, with Boeing Stratocruisers and Skymasters. In order to maintain services a number of Skymasters are being transferred from operations on the Korean airlift.

AUSTRALIAN CROSS-WIND TESTS

FOLLOWING a six-month experiment in the use of the Goodyear cross-wind landing gear on DC-3s, the Australian Department of Civil Aviation has been able to draw its own conclusions as to the particular merits and method of using this type of undercarriage.

In an interim report submitted recently by the Department's examiners it is stated that the aircraft has been successfully landed in 90 deg cross-winds of up to 50 m.p.h. During the recent floods in Australia, which affected the Tamworth area and necessitated extensive supply dropping operations, a Dakota fitted with this gear was subjected to landings in particularly severe conditions. Because the surface of the airfield was soft it was found necessary



ENGINES TO MATCH: As the series already bears the name Bretagne, it is perhaps appropriate that the S.O. 30, a project of the Société Nationale de Constructions Aeronautiques du Sud-Ouest, should be powered experimentally by two Hispano-built Rolls-Royce Nenes. This machine, which will be used for research into the operating problems of jet transports, recently made its first flight at Villacoublay.

CIVIL AVIATION . . .

to keep the aircraft moving at high speed to prevent it from becoming bogged. Take-offs were begun immediately after a tight 180 deg turn. Despite the fact that runways later became rutted and imposed severe lateral strains on the undercarriage, no mechanical faults are so far reported.

Australian pilots have expressed the opinion that the gear should be used with normal corrective procedure. In other words, in cross-winds of more than 20 m.p.h. the pilot should line up with the runway just before touching down. "Wheelers" are preferred to three-pointers and it is recommended that the gear should be locked in the central position for taxying, so that swivelling of the wheels, due to camber and apron slope, is eliminated.

It is considered that, used with the normal corrective technique, the cross-wind gear is an added safety factor which compensates for sudden changes in wind-strength at the point of touch-down, provides added tolerance for pilot error, and gives rise to a more efficient airflow over the wings during take-off; tyre wear is also reduced. The Department's tests are being continued.

SWISSAIR MAINTENANCE PERMIT

SWISSAIR is the latest of the major European operators to be granted C.A.A. permission to undertake the repair and overhaul of American-registered aircraft. The efficiency of the company's technical staff and the quality of technical work undertaken at the maintenance bases at Geneva and Zurich was officially recognized by the presentation at the company's headquarters in Zurich, on March 7th, of the C.A.A.'s Aircraft Repair Station Certificate. Swissair personnel are already experienced in the maintenance of DC-3s, DC-4s and Convairliners which, together with a number of smaller aircraft, comprise the company's fleet.

Incidentally, delivery is expected, in May or June, of two DC-6Bs, which have been on order since last year.

U.S. AIRLINE'S MEETING

A MEETING of the board of directors of Trans World Airlines, due to take place in London to-day will mark the first occasion on which the company has held such a meeting outside the United States. Announcing this recently, the chairman, Mr. Warren Lee Pierson, said that the arrangement was an extension of the company's policy of holding meetings in the principal cities on T.W.A. routes throughout the United States.

The 17 board-members who will gather in London include Mr. A. B. Eisenhower (a brother of General Eisenhower) and Mr. Noah Dietrich, president of the Hughes Tool Co. and chairman of R.K.O. Pictures, Hollywood.

BREVITIES

WITH effect from April 1st, Benina will become the designated civil airport for Cyrenaica, and from that date El Adem, which is now used, will be an entirely military airfield controlled by the R.A.F. Civil aircraft wishing to use El Adem will in future be allowed to do so only after special permission has been obtained from the Air Ministry.

* * *

Following unusually heavy bookings, B.C.P.A. has announced its intention of running special services to North America in April. Those terminating at San Francisco will leave Sydney at 11 a.m. on Fridays, returning at 7p.m. the following Tuesday; commencing date is April 6th.

* * *

Next month B.O.A.C. Yorks will be engaged on a minor airlift from Berlin to Sydney; 132 German emigrants, all of them skilled technicians, are being flown to Australia to work on a new hydro-electric project in the Snowy Mountains. The emigrants will travel by B.O.A.C. as far as Singapore, where they will transfer to Skymasters of Qantas Empire Airways.

* * *

Easter traffic booked on the services of Air France represents a company record for the total of passengers carried on one route in a single period. Over 1,000 were due to travel between London and Paris on Thursday, March 22nd; 37 Languedoc and DC-4 services were arranged to carry them. It was expected that at least 75 special services would be needed to lift the 2,000-odd passengers travelling over the entire Easter holiday. B.E.A. scheduled a total of 134 flights between London and Paris during Easter. There was also a heavy demand on services to Nice.

* * *

T.C.A., the State-owned Canadian operators, showed a deficit of some £441,700 in 1950, according to the annual report which was presented last week in the Canadian House of Commons. The overall loss represented a decline of nearly £1,000,000 as compared with the figure for 1949. The whole of the 1950 deficit was occasioned on Atlantic operations, domestic services having shown profit for the first time since the end of the war.

* * *

A new reciprocal agreement between Canada and the United States has resulted in considerably simplified arrangements by which pilots of private and non-scheduled aircraft may cross the border between the two countries. When flying to one of certain designated airports, pilots are now required only to file a flight plan with the Department of Transport's air traffic control unit, who will now notify separately the U.S. Customs and Immigration authorities.

On March 19th a B.O.A.C. Stratocruiser, carrying 29 passengers made the east-to-west transatlantic crossing in 12 hr 36 min. It was flying on one of the Corporation's new non-stop "Monarch" services, which are normally scheduled to complete the journey in 17 hr. This is believed to be the fastest London-New York crossing ever made by B.O.A.C.

* * *

Statistics recently published by the C.A.B. show that for the period July, 1949-June, 1950, the 49 big "irregular" operators in the United States amassed a total of 496,467,000 passenger-miles. The largest single total was that achieved by Transocean Air Lines based at Oakland, California. Because of the Korean airlift, figures for the current period of operations are expected to be much larger.

* * *

So popular were the S.A.S. "Midnight-Sun" sight-seeing flights to northern Sweden last year that the company has now started similar flights to the famous hill scenery of Jämtland. DC-6s are used, the aircraft leaving at 1030 hr and returning at 1400. Lunch is served on board and a commentary on the panorama is given over the aircrafts' loudspeaker system.

* * *

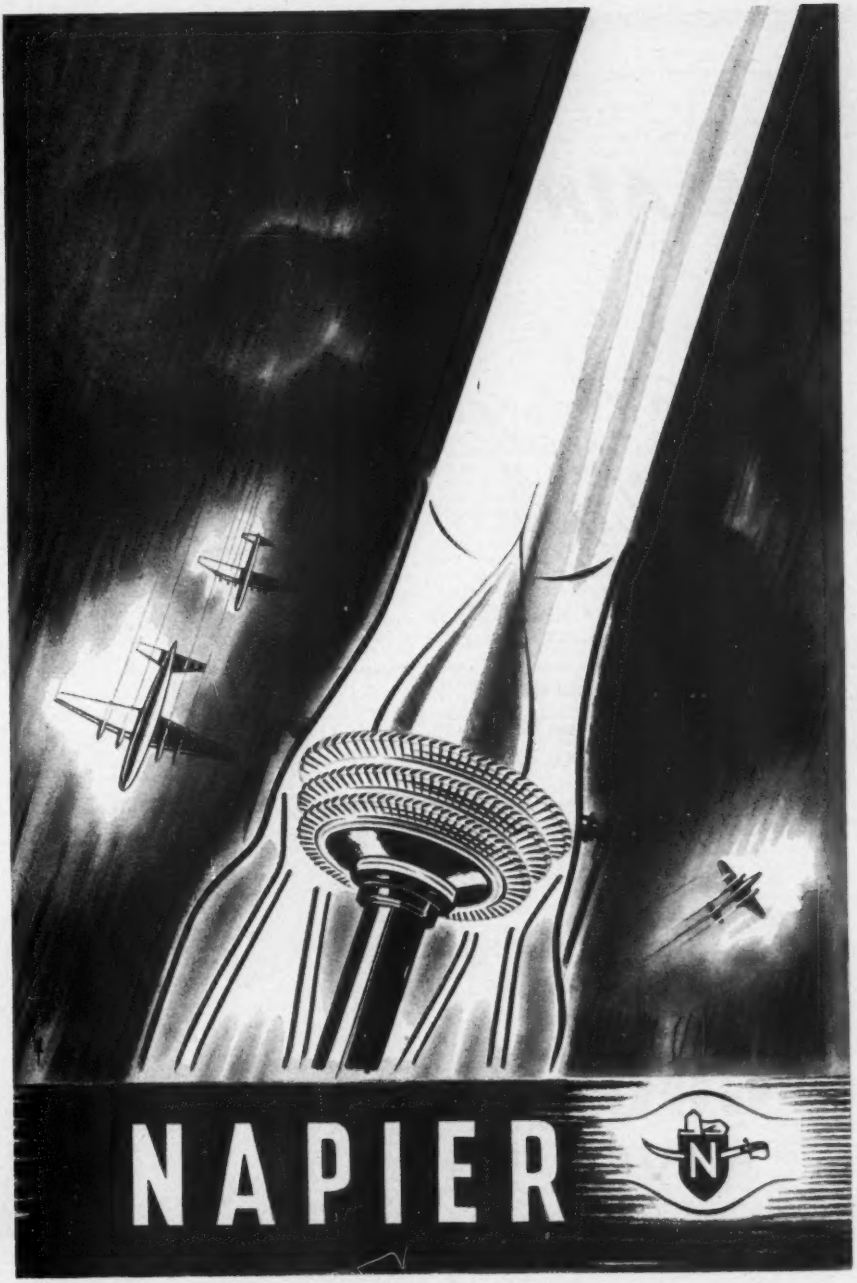
The Emperor of Yemen has engaged Capt. Olle Hagermark, a Swedish test pilot from the S.A.A.B. factory, as his private pilot. He will be stationed at Tiazz, the capital of Yemen, and join the staff of Yemen Airways. The chief traffic control officer at Bromma Airport, Stockholm, also left for Beirut recently, to organize flight-safety services in the Lebannon.

* * *

The Indian Government's proposal to take over Deccan Airways and Himalayan Airways, as a first step towards the complete nationalization of India's air-transport system, has been postponed indefinitely for financial reasons. The Ministry of Communications is of the opinion that it will be more "economical and efficient" for the State to run mail and passenger services between Calcutta, Bombay, Delhi and Madras.

* * *

An American "irregular" operator, California Eastern Airways, based at Oakland Municipal airport, is reported to have been the successful bidder in a somewhat unusual sideline—that of giving basic flight-training to several hundred U.S.A.F. cadet-pilots. Under the terms of the contract the Air Force will provide the base and the aircraft, while C.E.A. will be responsible for instruction and accommodation. Forty-five instructors will be required



AERO ENGINES

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AIR RACING

The Goodyear Trophy

The Goodyear Tyre & Rubber Company (G.B.) Ltd. have pleasure in announcing that the annual race for the Goodyear Trophy will take place this year on

Saturday, May 26th

AT WOLVERHAMPTON AIR PORT

Full details may be obtained on application to the Wolverhampton Aero Club, who are organising the event in conjunction with their Air Display on the same day.

PRIZES

The Goodyear Trophy : Replica to Winner

£200 prize money

GOODYEAR

AVIATION PRODUCTS

The Goodyear Tyre and Rubber Company (Great Britain) Ltd., Wolverhampton

CIVIL AVIATION . . .

initially, but the total of personnel employed at the base is expected to reach 400. The airline has recently been engaged on Korean airlift operations.

* * *

Philippine Air Lines, who operate a network of some 20,647 miles between San Francisco and London, *via* Manila and the Middle East, were called on to arrange a record total of 140 extra sections and charter flights during 1950. Of these, 122 were routed to Hong Kong, Tokyo, Guam and other Far East destinations. By introducing DC-6s on the route between Manila and Tokyo, P.A.L. have reduced elapsed time for this service by over 3½ hr; the present schedule is 11½ hr.

* * *

The fact that most British Dakota owners have disposed of their aircraft at the favourable prices offered by foreign purchasers has resulted in a fairly sharp rise in charter rates for both passengers and freight. One interesting fixture recently made is that of a "bare-hull time-charter" of a DC-3 to B.E.A. for a one-month period of crew training. A number of DC-3s are now carrying full cargos of lettuces between Amsterdam and London. American buyers are still offering to purchase any type of American-built aircraft, including Beechcraft 18s, DC-3s, DC-4s and Constellations.

* * *

South African reports indicate that, having apparently recovered from their early teething troubles, B.O.A.C.'s Hermes are now running with as much regularity as any other type employed on the London-Johannesburg route. The original faults are said to have emanated from the need for a piston modification in the engines; this has now been carried out, and in February the Hermes, running a thrice-weekly schedule, were delayed in only three occasions by mechanical faults.

* * *

With effect from April 8th and 9th respectively, *de luxe* all-sleeper flights are being added to T.W.A.'s routes from London and Paris to New York. This will be the only all-sleeper service provided on the Atlantic route; the aircraft to be used are "Ambassador" Constellations, each fitted with 18 berths, some of which may be reserved for double occupancy. An extra charge of £3 10s. is made for the additional facilities provided on the flights and the charge for a sleeping berth is approximately £9. Scheduled time for the non-stop journey is 11½ hr for aircraft travelling in the eastbound direction.

CLUB AND GLIDING NEWS

THE Plymouth and District Aero Club, which operates from Roborough aerodrome at Crownhill, near Plymouth, held a dinner and ball to celebrate its 21st birthday on Wednesday, March 7th; the venue was the Continental Hotel, Plymouth. The club was honoured by the presence of A. V-M. G. R. C. Spencer, C.B.E., as the guest of honour, and the event was extremely well supported by a large number of members accompanied by their friends.

Although recent flying activities have been hampered by bad weather, over 80 hours was recorded in February and, apparently, March is proving an even better month. The first group of A.T.C. cadets began their training during the latter part of 1950 and—despite serious delays caused by bad weather—have now almost completed their course of training. The club is hoping to train a considerably larger number of these very enthusiastic pupils this year.

IN last week's issue we published some facts from the British Gliding Association's annual report, which was read by the chairman, Mr. Philip Wills, C.B.E., at the general meeting held at Londonderry House on March 17th. The full report, which has subsequently become available, reveals considerably more of the Association's extensive work than is conveyed by the operational results published in last week's summary.

For example, during the past year, the Association's technical committee has been engaged in the operation of the new airworthiness scheme. It has initiated the appointment of an "Examiner of Approved Inspectors," who will ensure, by visiting B.G.A. instructors, that the standards of glider airworthiness are maintained at a high level. The technical committee is also currently engaged on evolving a procedure for the issue of Cs. of A. for privately designed and built gliders. To date 85 certificates have been issued and 33 individuals and 11 firms have received B.G.A. approval.

The instructor's panel is another section of B.G.A. which has been particularly busy during the year. Twelve "B.1", 21 "B.2" and two "A" categories have been granted. Seven civilian clubs are reported to have instructors possessing categories, while nine active civilian clubs have not. The Association is hoping to run a five-day instructors' course later this year, tentative dates being April 16-20th and the place Lulsgate or Redhill. Interested clubs are invited to contact the B.G.A.

The research committee busied itself with trying to determine which of numerous projects submitted merited the investment of money standing to the credit of the Association research account. It was finally decided to recommend the award of an annual prize, to be given to the individual or organization which is adjudged to have made the greatest technical contribution to British gliding. Details are now being worked out. The research group reports, incidentally, that V.H.F. radio sets should shortly be available for sailplane owners.

Another interesting sidelight on the work of this group is the compilation of the report on the value of *g* which is sustained by a glider in normal club flying. It was found that, although in normal flight these forces were low, during aerobatics forces of 4.9 *g* at 100 m.p.h. to −0.8 *g* at 75 m.p.h. were recorded. The minus result was the only one which was slightly outside the "flight envelope" permitted for aircraft in the semi-aerobatic category.

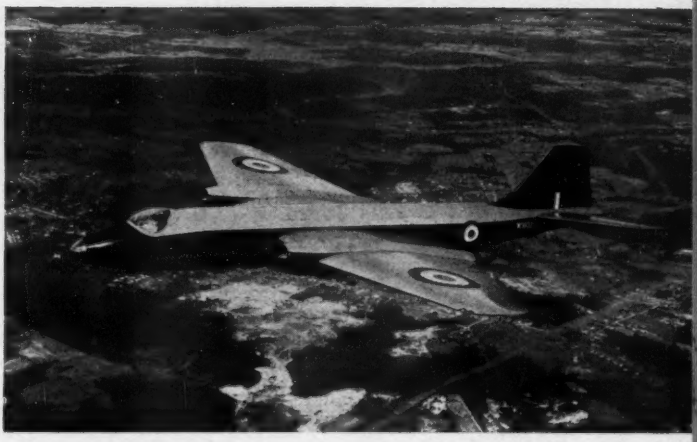
During his report to the meeting the B.G.A.'s chairman spoke of the valuable support which the Association continues to receive from the Kemsley Flying Trust. Fifteen clubs have now been granted loans, totalling £15,030, of which £2,395 has been repaid. The trustees have also agreed to finance the scheme for an Examiner of Approved Instructors, referred to previously. Perhaps the most notable instance of the Trust's generosity, however, has been the joint contribution, with the Ministry of Supply, of some £8,500 for the design and construction of three prototype high-performance two-seat sailplanes. The chosen design was that submitted by Mr. Hugh Kendall, the Handley Page test pilot, and the construction work has been entrusted to F. G. Miles, Ltd. To supervise the progress and development of this design the Association has appointed a high-performance two-seater progress committee, part of whose work will be to control the progress payments made from time to time to the manufacturers.

The B.G.A. has, incidentally, offered to act in the capacity of host at the next International Gliding Contests. France, Spain and the Argentine have made similar offers. The facilities which each country can make available will now be considered by the World Gliding Commission and a final selection is expected to be made at the next meeting of that organization early in July. Failing this, it is understood, selection will be made by a postal ballot among the 34 countries represented on the W.G.C. Normally held every two years, international gliding contests since the war, have taken place in Switzerland (1948) and Sweden (1950). If Britain's offer is accepted it is probable that the contests will be held at the Derbyshire and Lancashire Gliding Club site at Camphill, near Great Hucklow, the scene of last year's National Contests.

COMING OF AGE: Among those present at the recent dinner and ball—as mentioned on this page—to commemorate the 21st birthday of the Plymouth and District Aero Club were (left to right), Sir Arthur Hollely (chairman), W/C. R. J. B. Pearse, O.B.E., A.F.C. (manager), and Mr. Patrick FitzGerald (social secretary) who are seen with A.V-M. G. R. C. Spencer, C.B.E., who was the club's guest of honour for the evening.

SERVICE AVIATION

Royal Air Force and Naval Aviation News



CHANGE OF SCENERY for the English Electric Canberra 2 flown to America recently by an R.A.F. crew. It is pictured near the factory of the Martin Company at Baltimore, Maryland, where a night intruder version will be built for the U.S.A.F. (other pictures on page 368).

AT General Eisenhower's H.Q. in Paris on March 20th, it was announced that Air Chief Marshal Sir Hugh W. L. Saunders, K.C.B., K.B.E., M.C., D.F.C., M.M., had been appointed Deputy Supreme Commander (Air), Western Europe.

Last February, Sir Hugh Saunders succeeded Air Chief Marshal Sir James Robb as C.-in-C., Air Forces Western Europe. He had previously been Inspector-General of the R.A.F. from October, 1949. Previously, he was for two years Air Member for Personnel, and A.O.C.-in-C., Bomber Command from January-October, 1947.

Aged 56, Sir Hugh began his career in the Witwatersrand Rifles in 1914. During the First World War he was commissioned in the R.F.C. and destroyed ten enemy aircraft. He was awarded an R.A.F. permanent commission in 1919.

During the last war, Sir Hugh Saunders commanded No. 11 Group, Fighter Command, from 1942-44, when he was appointed Director of Postings at the Air Ministry. From August, 1945, until the end of 1946, he commanded the R.A.F. in Burma. In addition to his British decorations he holds the insignia of Commander, U.S. Legion of Merit, and is an Officer of the French Legion of Honour.

Air Chief Marshal Sir Hugh Saunders

R.F.C.–R.N.A.S. Re-union

AMONG the pioneers of Service aviation expected to assemble at the R.F.C.-R.N.A.S. Reunion on Friday, April 13th, are Marshals of the R.A.F. Lord Trenchard, Lord Tedder and Sir John Slessor, the present C.A.S. The reunion, to be held at the Dorchester Hotel, is for those who served in the Royal Flying Corps or Royal Naval Air Service before the merger on April 1st, 1918. On April 13th, 1912, the R.F.C. was formed, absorbing, by Royal Warrant, the Air Battalion of the Royal Engineers, formed a year earlier.

The first R.F.C.-R.N.A.S. reunion, held last year, proved so popular that many who wished to obtain tickets were unable to do so. By a change of venue this year, the organizers hope to accommodate all those wishing to attend. Further details and tickets (30s including cocktails and buffet) may be obtained from Capt. Keith Davies, 30, Harleyford Road, Vauxhall, London, S.E.11.

The new R.O.C. Commandant

THE appointment is announced of A.Cdre. G. H. Vasse, C.B.E., as Commandant of the Royal Observer Corps. Until recently, A.Cdre. Vasse commanded No. 63 (Western and Welsh) Group, Home Command, and was previously—in 1947-48—A.O.C. No. 25 Group, Flying Training Command. Born in 1899, he entered the R.N.A.S. as a boy mechanic in 1916, and was commissioned the following year.

Naval Gliding

AT the annual meeting of the Royal Naval Gliding and Soaring Association, held recently at Lee-on-Solent, the chairman, Capt. D. McI. Russell, announced that two of the branch clubs had doubled their activity in 1950, as compared with 1949. The Portsmouth club had made 2,000 flights (950 in 1949) and the Fulmar club at Lossiemouth had made 1,100 (550). Eglinton and Arbroath had managed, respectively, 200 and 150 launches; at Stretton, flying awaited the arrival of an instructor, though the club there had winches, gliders and plenty of

PARADE—WUFF! Squad-drill for seven R.A.F. Alsatians at the Police-dog Training Centre, Netheravon; they are seen only half-way through the six-week training course. Since the R.A.F. first adopted dogs for police work in 1940, over 8,000 (mostly from private homes) have been selected, trained and posted. Alsatians are the standard type in service.

members. Two Slingsby T.31 two-seat trainers would be bought, and allocated to the Lossiemouth and Arbroath clubs.

It had been decided, said Capt. Russell, to subsidize by one-third the insurance of Association gliders on hire to clubs. In order to improve the standard of instruction, clubs would also receive financial assistance to enable them to send representatives to the B.G.A. Instructers' course in April. The Association would enter a team this year to defend its title at the National Gliding Championships, and it was hoped to borrow more than one sailplane on loan from the Admiralty (last year, it will be remembered, the Naval team, consisting of Lt.-Cdrs. A. and N. Goodhart, reached 2nd place out of 29 entries).

The Association decided at the meeting to invite Vice-Admiral C. E. Lambe, the new Flag Officer Air (Home), to become its president, in succession to Admiral Portal, who recently resigned on leaving Home Air Command.

Naval Pilot Lost

THE Admiralty has announced that Lt. G. H. Cooke, the pilot of a Naval aircraft from H.M.S. *Theseus*, has been reported missing, presumed killed, following a dive-bombing attack on a bridge in Korea.

R.A.F. Club Membership

AT a forthcoming meeting of the Royal Air Force Club it will be proposed that serving officers of dominion, colonial or foreign air forces may, at the discretion of the committee be invited to become temporary members of the Club on payment of the appropriate subscription, but without entrance fee.

R.A.F. Married Quarters

ALLOWANCE for 4,000 additional married quarters for the Royal Air Force Stations in the United Kingdom has been made in the Air Estimates for 1951-52. A similar number are in course of construction and are expected to be completed within the next financial year, which begins in April. Overseas, an additional 440 married quarters will be put in hand. Others are in progress and it is expected that 600 will be completed within the next year. During the present financial year, approximately 1,750 new permanent married quarters will have been completed at home stations and about 300 at overseas stations.

Meteorological Brigands

IN addition to their dive-bombing and rocket attacks on the Malayan bandits, Bristol Brigands are also being used by Far East Air Force for meteorological duties. Each day a Brigand of No. 1301 Met. Flight, based at Negombo, Ceylon, takes off for a weather flight over the Indian Ocean to investigate the local monsoonal air-currents and inter-tropical frontal zone. The first part of the daily sortie is made at a standard height of 1,700ft, with occasional descents to sea level. Then the aircraft climbs spirally to 25,000ft and levels off to observe temperature, humidity and cloud development. Turbulent clouds are often encountered and aircraft have on several occasions returned with aerials destroyed or de-icing equipment torn off. No. 1301 Flight, which has a total complement of 30 aircrew and ground staff, is commanded by F/L. D. G. Walker.

For Service in Malaya

THE following appointments and awards for officers and men of the R.A.F., for service in Malaya between June 1st and November 30th, 1950, have been approved by the King.

C.B.E.

G/C. J. L. F. Fuller-Good.

O.B.E.

W/C. P. Fleming; S/L. A. Stevenson.

D.F.C.

S/L. A. K. Furse; Flight Lieutenants W. B. Bezy and K. W. Dalton-Golding.

D.F.M.

F/S. B. Collen; Sgt. J. C. Mottram.

B.E.M.

F/S. S. M. Eames, W.R.A.F.; Flight Sergeants W. G. Pearce and D. A. Stewart; Sergeants A. Evans and Mohammed bin Kasban; L.A/C. R. H. Weller.

MARITIME HASTINGS: A Handley Page Hastings of the type in service with the Coastal Command meteorological squadron at Aldergrove, Northern Ireland. Aircraft from this unit make a 1,600-mile flight over the Atlantic every day to acquire information on cloud formations, temperature, pressure and humidity.

To Command R.A.T. Group

THE Air Ministry announces the appointment, next May, of A. Cdre. H. H. Brookes, D.F.C., at present Director of Flying Training at the Air Ministry, as A.O.C. the Rhodesian Air Training Group. A.Cdre. Brookes, who is 46, was commissioned from Cranwell in 1924. At the outbreak of war in 1939, he commanded a wing in the Middle East and was later on operational duties at Air Headquarters, Aden, until the end of 1940. Returning to the United Kingdom, he spent some months in the operations room of the fighter unit formed for the defence of merchant shipping, and towards the end of 1941 went overseas again as staff officer in charge of administration at Air Headquarters, West Africa. He was given command of No. 298 Wing in West Africa in 1942.

Back in England in 1943, he commanded R.A.F. Station, Breighton, Yorkshire, for a year before becoming senior officer in charge of administration at Headquarters, No. 7 (Bomber) Group, in 1944. From early 1945 until June, 1947, he commanded R.A.F. Station Habbaniya, Iraq, and was afterwards S.A.S.O. at Air Headquarters, Iraq, for six months, before returning home to command R.A.F. Station Swinderby, Lincs., where he remained until June, 1949.

Benevolent Fund School

THE Duchess of Kent, president of the R.A.F. Benevolent Fund, recently visited the residential school established by the Fund for boys whose fathers were killed serving in the R.A.F. The school, at Vanbrugh Castle, Blackheath, London, houses boys between seven and school-leaving age, and those who decide to make the R.A.F. their career are prepared for the apprentice examinations. Boys under 11 are educated at Vanbrugh Castle and most of those over 11 attend local secondary schools.

On her visit to the school, the Duchess of Kent was received by Lord Riverdale, chairman of the council of the Fund, and A.V-M. Sir John Cordingley, the controller.

AERIAL RADIATION

New Measurement Method: Use of Scale Models

AMONG apparatus to be shown at the Physical Society's Exhibition at Imperial College, South Kensington, from April 6th to 10th will be an entirely new device designed to plot, by the use of scale-model aircraft, the radiation characteristics of aircraft aerials. Made by Ferranti, the equipment is known as "a radiation-pattern recorder."

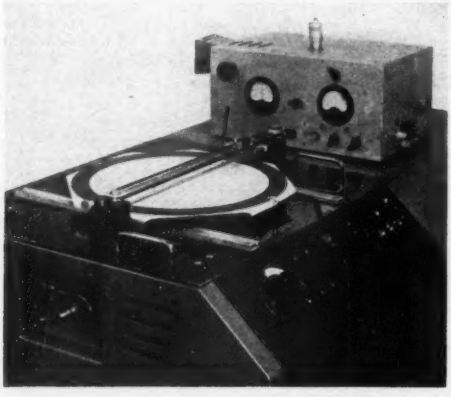
In an aircraft aerial the radiation pattern may be appreciably modified by the presence of the machine itself, especially when the aircraft size exceeds the wavelength. The shape and positioning of the principal components and asymmetry in the fore-and-aft direction all contribute in varying degrees to produce a distorted radiation diagram. Mathematical computation of aerial behaviour thus becomes very difficult. Qualitative forecasts can be made in most cases, but are usually of little value in determining optimum aerial siting for a particular application; only by resorting to actual measurement can any precise picture be obtained.

Experiments on full-scale aircraft, however, are difficult. Measurements made with the aircraft grounded are immediately ruled out, since stray reflections must be avoided and a truly three-dimensional family of radiation patterns is desired. On the other hand, flight tests may be expensive and inaccurate.

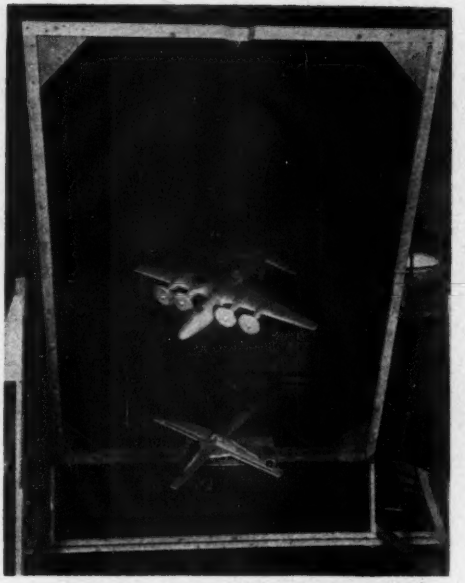
The solution to these difficulties, claim Ferranti, lies in the use of models in which both aircraft dimensions and operating wavelength are reduced by the same scaling factor. Experimental conditions can then be controlled with ease, and advantages are gained in compactness, accuracy and cost. By choosing a suitable suspension system, ideal free-space conditions can be simulated.

The radiation-pattern recorder was designed primarily for this purpose, though the apparatus is flexible and may be adapted if required to other problems. As initially developed, the equipment is intended to cater for the aircraft installation of L-band aerials (30 cm) in connection with the Ferranti-developed D.M.E. By using a scaling factor of 24, the modelling wavelength falls in K-band (1.25 cm) and a typical passenger aircraft has a scaled wing-span of, say, 4 to 6 feet—a convenient size. The yoke suspending the model allows both principal plane (great circle) and small circle patterns to be taken. The model acts as a transmitter, but results thus obtained are, it is stated, equally valid whether the full-scale aerial is to be used as a transmitting or as a receiving element.

The receiver is of the superhet type with an intermediate frequency of 45 mc/s. The recorder can be used over a wide range of wavelengths by changing either the scaling factor or the receiver head, or both. Also, a stable high-gain receiver becomes permissible. Working range can be made large (up to 1,000 wavelengths at K-band) despite limited transmitter power. Thirdly, a piston attenuator can be introduced. This provides a high degree of accuracy and a power scale which is linear in db.



Top of the recording unit, showing controls and plotting table.



Method of suspending test-model inverted in a gimbal mounting.

The recording equipment consists essentially of two separate servo-mechanisms. The first, the rotational system, produces motion of the plotting table in sympathy with the remotely controlled rotation of the aircraft model. The second, the translational system, determines the deflection of a pen according to the instantaneous value of the power radiated by the aerial under test. Plots may be taken either in Cartesian or polar co-ordinates, for a maximum variation in signal power of 40 db, and for a writing speed normally between 1.5 and 2 min per pattern.

This recorder was developed by Ferranti under M.o.S. contract.

VERSATILE POWER-SAW

AN unusually compact and versatile transportable power hack-saw has recently been produced by the Tungum Sales Co., Ltd., Painswick Road, Cheltenham, Glos. Known as the "Beaver", it has a maximum work-section capacity of 4½in for ferrous and non-ferrous metals of any cross-section. Power is supplied by a ¼ h.p. single-phase A.C. 220/230-volt motor driving through a vee-belt, and the supply can be taken from any convenient socket.

The high-speed-steel blade, 12in long, is relieved of load on the return stroke to save wear. A support-trestle for lengthy material is available at a small extra cost. Dimensions are 20in x 18in x 22in high, and the weight is 92 lb.

The makers emphasize that the "Beaver" has not been designed for high-speed production, but rather as an inexpensive tool that can conveniently be used in a variety of situations.

FOR FACTORY EXTENSIONS

ORDERS under the expansion programme will mean, for many firms in the industry, a search for increased factory-space, and in this connection one of the products of the structural-steelwork division of Chamberlain Industries, Ltd., Staffa Road, London, E.10, is of topical interest.

It is a steel-framed building designed on the unit principle, so that a single section may be extended in length as and when required by the addition of the necessary number of stanchions, roof-trusses (at 10-ft intervals) and asbestos-sheet walling and roofing.

The roof-spans available are 36ft, 48ft and 60ft, and there is a choice of heights of 12ft, 14ft, 16ft and 18ft. With suitable doors such buildings would make useful hangars for small aircraft.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"The Sound of Speed"

WITH reference to the paragraph under the above heading in your issue of March 16th, there was a somewhat similar incident in this country at the R.Ae.S. Garden party which followed the S.B.A.C. Show at Radlett on September 15th, 1946. During the fly-past of fighters, John Derry, then a Supermarine test pilot, dived steeply in a Seafire, and pulled out sharply. When he was well on the way up, there was a noise as though another aircraft was following him down. Then came a mighty, rushing wind which picked up a number of coats and rugs from the grass, depositing at least one on the other side of the railway. I thought the noise was caused by wing-tip vortices filling up, but probably it was the shock-wave under the wings when pulling out, for even then John Derry was probably venturing as near the sonic region as he could.

London, S.W.3. GEOFFREY DORMAN

[In view of the aircraft-type mentioned, we are inclined to think that vortices were a more likely cause than shock-waves. At the 1947 Garden Party, we remember, a Meteor 4 flown by S/L. Waterton produced a similar phenomenon on mushing at the end of a large-diameter loop; we have also seen a "whirlwind" follow a straight, low fly-past by a Sea Fury. An explanation would be interesting.—Ed.]

Veteran Aircraft

I HAVE been most interested in the articles in *Flight*, on the subject of veteran aircraft and also in the subsequent letters in your correspondence columns.

As the owner of four Blériots and eight other veterans built prior to 1919, I have been in a position to obtain the views of many people as to the best way of presenting these machines at present-day displays.

There is no doubt that many of the "general public" at first think of a contraption of string, wood and canvas, but that after a little more thought they realize how much is owed to these early machines, their designers and pilots and that flights across the Channel or round Europe could not have been made by something held together with string. This line of thought has some bearing on the question of commentators' annoucements at displays. The organizers usually look to the public enclosures to make a meeting a financial success and they realize that the majority of the people are out to enjoy themselves. However, I see no reason why certain performance-data and details of historic flights could not be worked into such commentaries.

The next point is whether to fly the aircraft or have them as static exhibits. Most people, I think will agree that machines 30 or more years old should not be flown as if they had just left the factory, with a contemporary test pilot at the controls. Pre-1914, air displays were more leisurely affairs and it was not a question of getting four or five veterans taxied, flown and removed from a runway within 4 or 8 minutes. Now, therefore, it is a case of doing the best one can in the available time, whilst also remembering that ideal weather conditions are hardly ever available during a summer afternoon. Further, contemporary pilots were mostly thoroughly used to the machines they flew and got the best out of them. It was not a question of a pilot used to thousands of horse power flying them on 20 or 30 h.p., with perhaps five or ten minutes' previous practice; and I know from experience that it takes some hours to get the best out of any early aircraft or automobile engines, as they are quite temperamental and like their own minute adjustments.

There have been references in your correspondence to early Blériots and other machines, in connection with which the following may be of interest.

As to the height obtained by Blériot and others with the "Fan"-type side-valve Anzani, in 1935 I was at the old R.F.C. aerodrome near Dover Castle, assisting with a section of a film on the history of aviation), depicting Blériot's Channel flight. On this occasion the 1910 XIa Blériot was used, with the 40/45 h.p. six-cylinder Anzani motor. It was found that on days of near calm difficulty was experienced in crossing the cliff line, and with a stiff breeze the difficulty was considerably increased. On this occasion the approximate course of Blériot was taken from the east end of the aerodrome to Dover harbour, when a right turn was made, with a slight dive into the gap on the east of Dover Castle; about 200 yards inland, near where Blériot landed heavily, a further right turn was made and the larger Anzani motor just permitted the aeroplane literally to climb the hill, with altitude of perhaps 10-20 feet or less back to the aerodrome area. It would, therefore, have been impossible for Blériot to have got out of this gap with the little side-valve "fan" motor.

I have a film in the library section of my collection which shows him taking off and crossing the coast on the Channel flight, and in 1936, I saw an excellent film of him flying along the coast near St. Margaret's Bay, and also of the machine after the landing in the gap near Dover Castle. From these films it would appear that Blériot attained an altitude of 150-200ft on the way over, was down to about 50ft near St. Margaret's Bay and climbed to nearer 200ft to cross the coastline. These little Blériots were usually flown at 20 to 50ft at contemporary air displays and even for longer flights. The original owner of my No. 54 Type XI informed me that he was "measured" at 600ft and that other pilots attained 400-600ft given good conditions. Incidentally, how many readers remember that the side-valve "fan"type Anzani was originally developed from an engine made for those long-framed motorcycles used for pacing bicycles on record attempts? And who remembers that there was a "fan"-type Anzani with overhead exhaust and automatic inlet valves (one of these I possess)? The pistons and cylinders could be used on the "Y" type as fitted to the Deperdussin monoplane and the engines were supplied with or without ports drilled in the cylinder walls. These larger "fan" engines were fitted to the 1910 XIa Blériots.

As the owner of the Avro 504 which was used at the 1950 R.A.F. Display, I am afraid I should have taken a very poor view if any attempts at aerobatics had been undertaken. I know full well that the pilot could have made a faultless display, as he had many years of experience on the type. However, my views are that I want future generations to see these machines and I consider that any additional risk to the aircraft is not justified, even if time permits.

I am afraid I am not a believer of the legends of aircraft not flying unless smoke went straight up or funny things happened with damped fingers or handkerchiefs. I have photographs from the 1908-9 Voisin and Henry Farman era of these machines flying and taking-off down-wind while smoke from chimneys was parallel with the ground, and others of machines of slightly later date flying into wind in similar or worse conditions. I agree, however, from my own experience that these machines had to be kept spot-on into wind when attempting to take off and fly in these more exciting conditions.

Weybridge, Surrey. R. G. J. NASH.

Couriers, Envoys and All About Them

CONGRATULATIONS on the excellence of "Ferry to Ambassador" (*Flight, February 23rd*) which I enjoyed every minute of reading. Turning up my own "history file" on Airspeed's, it has occurred to me some of your readers would perhaps be interested in very brief details of the individual histories of the majority of AS.5 Couriers and AS.6 Envoys.

The original first production Courier, G-ACJL, after being demonstrated in Europe by M. L. Bramson, was sold to an Australian operator in November, 1934, and became VH-UUF. The first and only "Colonial" model, which R. K. Dundas demonstrated in India, was G-ACLF. G-ACLR and G-ACLT were operated by P.S.I.O.W. Aviation, Ltd., whilst G-ACLS, belonging to Air Taxis, Ltd., was short-lived, since it crashed in Kent in 1934. The Courier delivered to the R.A.E. Farnborough was serial numbered K.4047, whilst the sole Rapier IV version belonging to A.V-M. Borton was G-ACNZ.

In 1935, London Scottish and Provincial Airways, Ltd., and North Eastern Airways, Ltd., were formed. The first company operated Manchester-Heston-Paris with two Couriers, G-ACSY and G-ACSZ: the second operated Edinburgh-Woolsington-Doncaster-Croydon with four aircraft of this type—G-ACVE, 'VF, 'VG and'SZ. Of these six aircraft, it is sad to record that only G-ACVF survived in the U.K.; G-AVGC was sold abroad, and the other four were all written off in crashes, By 1939 the P.S.I.O.W.A. Courier fleet numbered eight, and in 1940 all were impressed into the R.A.F. and A.T.A. Lastly, as recently as the summer of 1947, I heard that G-ACVF was the only example still flying in this country. It was based at Southend Airport, and owned by East Anglian Flying Services, Ltd.

Turning to the beautiful and shapely twin-engined Envoy series, the prototype, which made its first public appearance at the S.B.A.C. Show in July, 1934, was G-ACMT, and was painted silver and green. G-ACVH was the first production model and, like the prototype, was fitted with 185 h.p. Wolseley engines. The

CORRESPONDENCE . . . .

next model, G-ACVI, was fitted with 205 h.p. Wolseley radials, and christened *Miss Wolseley*—it was owned by Lord Nuffield and based at Castle Bromwich. In 1936 this machine was sold to Ansett Airways (which had just been formed in Australia) and became VH-UXM. Having completed 8,000 hours by 1944, it was re-fitted with Wright Whirlwinds, and is still going strong after 16 year's service! G-ACVJ was fitted with A.S.Lynx 4C engines, and in 1936 was owned by Commercial Air Hire, Ltd.; eventually it finished up in Spain and was written off in the Spanish Civil War. C. P. T. Ulm's ill-fated machine, VH-UXY, was lost on a Pacific flight in late 1934. The next five Envoys built were G-ADAZ, 'BA, 'BB, 'CA and 'BZ and they were all employed on U.K. internal schedules by different operators. Then came the Japanese order for six, followed by the licence to build this type in Japan. The famous King's Flight Envoy, G-AEXX, became L.7270 when it was used by the R.A.F. in war-time. In 1946 it again became G-AEXX for a short spell at Hanworth, when it was sold to a Swedish owner, and is still flying as SE-ASN in Sweden. The example flown to China by G. B. S. Errington was G-AEXE, whilst the luxury model sold to the Maharajah of Jaipur was VT-AIC. In 1939 the only Envoys flying in this country were G-ADAZ, 'BA, 'XX and 'WZ. Today, the sole example still flying in the U.K. is G-AHAC, which was pre-war ex-R.A.F. P.5626. It is now owned by Mr. N. C. Alderson of Manchester.

Its a great pity the protype Courier and Envoy (also the Oxford) have not been able to be preserved by Airspeed's, since all three have been truly history-making British aircraft.

Prestwick, Ayrshire. DENNIS M. POWELL.

[This leaves us very nearly speechless—and makes us wonder if the Air Registration Board might not consider engaging our correspondent and dispensing with the whole of its office staff forthwith.—ED.]

IN BRIEF

OVER 450 unbound copies of *Flight*—a collection dating from November 13th, 1941, to March 2nd, 1951, with only one issue missing—are offered free to any individual or association willing to pay for their carriage and supply a suitable box or boxes. This generous offer is made by a Scots reader, Mr. Hector Soutter, of Annfield, Barclaven Road, Kilmacolm, Renfrewshire; he mentions that, when piled, the copies reach a height of 5ft. 6in.

* * *

Towards the end of 1950 there was a printing-trade dispute, and for several weeks doubt existed until the eleventh hour as to whether or not *Flight* could appear on the bookstalls. On one occasion several editorial pages were called for at a moment's notice, and a contributed article—on carrier operations—went to press with several inaccuracies and inadequacies. We regret its shortcomings—but no more complaints, by request!

THE CROWDED CALENDAR

AVIATION's busy lecture-season is now approaching its end, but an even more crowded calendar of outdoor events will shortly begin to replace it. As will be seen from the fixture list, below, of the principal events notified for the forthcoming season, there is scarcely a single week-end without an event of some importance. Most of those listed are to take place in the United kingdom—others, principally rallies—have been notified by Continental organizers.

Seven race-meetings are so far scheduled, beginning with the Isle of Wight contest on May 12th-13th. The major event, of course, will be the Royal Aero Club's Festival of Britain National Air Races at Hatfield on June 23rd, replacing the National Races which last year were spread out over a number of venues on various dates. With eight events to be flown the day should be a busy and exciting one.

The *Daily Express* Race, held for the first time last year, will again take place, and on this occasion the centre will be Shoreham Airport (August 6th).

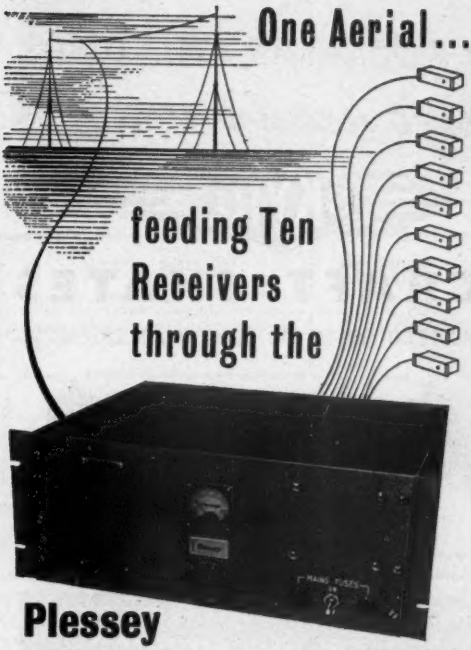
Several municipalities are organizing air displays, and at least one of these meetings—at Bristol on July 14th—racing is to form the principal attraction. Whitchurch will be the Airfield used.

Of other events which do not come into the above categories the S.A.B.C. Show (September 11th-16th) is, of course, outstanding; after some doubt about the venue, it was recently announced that Farnborough will once again be available. This year, owing to the preoccupation of the Service with training and re-equipment, there will be no R.A.F. Display. Many of the United States visitors to Farnborough will also be attending the third Anglo-American Aeronautical Conference, which takes place at Brighton from September 3rd-8th (a list of the papers to be read was given in our pages last week). This year, too, the biennial Paris Show takes place, from June 15th-July 1st.

An altogether new fixture is the R.Ae.C. International Rally and "Fifty Years of Aviation" Display and Exhibition, scheduled for July 19th-21st. Nothing may be revealed about this event at the moment, though it is known that—as the title suggests—the accent will be on aeronautical history, and that it will take place at an airfield near London.

The major event in the British gliding calendar is the National Contests, now confirmed for Camphill, Derbyshire, July 22nd-29th. Model-flying enthusiasts, also, have a full programme, only one or two main events of which we can list here. Also for reasons of space, incidentally, we have had to omit reference to the lectures still to be held by R.Ae.S. branches up and down the country.

Mar.	31.	Army v. R.A.F. Rugby, Twickenham.
Mar.	31.	R.A.F. College, Cranwell: Hockey v. R.M.A. Sandhurst.
Apr.	5.	R.Ae.C.: Film Show: *Pegasus, Air Beef and Supermarine.*
Apr.	6-10.	Physical Society: Exhibition, Imperial College, South Kensington, London, S.W.7.
Apr.	7.	British Interplanetary Society: "Evolution of Life in the Universe," by Prof. J. D. Bernal, F.R.S.
Apr.	10.	R.Ae.S. Section Lecture: "Simulators," by W. R. Thomas, B.Sc., A.M.I.E.E.
Apr.	12.	R.Ae.S.: "Comet Planning and Production Methods," by H. Povey, A.F.R.Ae.S.
Apr.	13.	College of Aeronautics, Cranfield: Senior Common Room, Society's Annual Dinner.
Apr.	13.	R.F.C. and R.N.A.S. Second Reunion.
Apr.	26.	R.Ae.S.: Discussion: "Air Travel from the Passenger's Point of View."
Apr.	26.	R.Ae.C. Film Show: *Flying Club*, 1925-50, film and commentary by A. Graham Head, and *Eagles of the Fleet.*
Apr.	28.	Exeter Aero Club Rally.
Apr.	29.	First International Helicopter Competition, Italy.
May	5-8.	Foire de Paris Rally, Toussus-le-Noble.
May	12-13.	Isle of Wight Air Races.
May	12-14.	Aero-Club de France: Champagne Rally.
May	13-14.	S.M.A.E. International Model Competitions.
May	14.	S.S.A.F.A.: Air Display, Hucknall, Notts.
May	19.	Derby Aero Club: "At Home" and Flying Display.
May	20.	Kent Coast Flying Club: "At Home" (sponsored by A.B.A.C.).
May	26.	Newcastle-on-Tyne Air Display.
May	26.	Wolverhampton Aero Club: "At Home" and Goodyear Trophy Race.
June	2-4.	Yorkshire Aeroplane Club: International Rally.
June	8-10.	Air Circuit of Sicily.
June	9.	Rally and Race, Fairwood Common Aerodrome, Swansea.
June	10.	Lancashire Aero Club: "At Home" (sponsored by A.B.A.C.).
June	15-18.	Royal Danish Aero Club: International Rally.
June	15-July 1.	Paris Aero Show.
June	16-17.	F.A.I. International Model Competitions.
June	16-17.	International Rally, Flers, France.
June	16-17.	Boston Aero Club: Rally.
June	23.	R.Ae.C.: Festival of Britain National Air Races, Hatfield.
June	23.	Ailes de Main Rally, France.
June	24.	Northern Heights Model Flying Club: Gala Day and Queen's Cup Contest, Langley Airfield.
June	24.	International Rally, Pisa, Italy.
June	30-July 1.	Cognac International Rally, France.
June	30-July 2.	R.Ae.C.: Members' Deauville Rally
July	1.	International Rally, Savona, Italy.
July	4-11.	F.A.I. Committee Meetings, Brussels.
July	7.	S.S.A.F.A.: Air Display, Prestwick.
July	7.	Aero-Club de Savoie: International Rally, Aix-les-Bains, France.
July	7-8.	R.Ae.C.: Members' La Baule Rally.
July	7-8.	International Wakefield Cup Model Contests, Finland.
July	14.	Bristol Corporation: Air Race Meeting.
July	14.	S.M.A.E. Festival of Britain Model Championships, Wembley Stadium.
July	15-18.	Royal Danish Aero Club: Rally.
July	15-22.	Aero Club of Italy: International Air Week.
July	16-20.	Aeronautical Union of Jugoslavia: International Parachute-jumping Competitions.
July	19-21.	R.Ae.C.: International Rally and "Fifty Years of Aviation" Display and Exhibition.
July	22.	Luton Flying Club: "At Home" (sponsored by A.B.A.C.).
July	22-29.	National Gliding Championships, Camphill, Gt. Hucklow, Derbyshire.
July	29.	Columbus Centenary Rally, Genoa.
Aug.	4-5.	Aero-Club de Touraine: International Rally, Tours, France.
Aug.	6.	*Daily Express* Challenge Trophy International Air Race, Shoreham Airport, Sussex.
Aug.	18.	International Air Circuit of Switzerland.
Aug.	18.	Wiltshire Flying Club: Thruxton to Isle of Wight Air Race.
Aug.	19.	Yorkshire Aeroplane Club: "At Home" (sponsored by A.B.A.C.).
Aug.	25-26.	International Air Circuit of the Dolomites, Italy.
Sept.	2.	A.B.A.C. Summer Convention.
Sept.	3-7.	R.Ae.S. and I.Ae.S.: Third Anglo-American Aeronautical Conference, Brighton.
Sept.	3-8.	International Congress on Astronautics.
Sept.	10-16.	Battle of Britain Week.
Sept.	11-16.	S.B.A.C.: Flying Display and Exhibition, Farnborough.
Sept.	15-16.	International Rally, Parme, Biarritz, France.
Sept.	25.	Milan International Grand Prix.
Oct.	31.	R.Ae.C.: Jubilee Ball.



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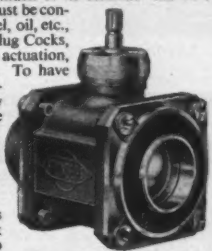

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FULL particulars and application form may be obtained on application to: Sudan Agent in London, Wellington House, Buckingham Gate, London, S.W.1. Please mark envelope: "Civil." [0044

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APPLICATIONS are invited for the following positions in the London area:

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APPLICATIONS are invited for the following positions in the London area:

DRAUGHTSMEN required for detail drawing of experimental designs of aircraft electrical equipment. Works experience essential.—Write, giving full details in strictest confidence, to the Employment Officer, Rotax, Ltd., Chandos Rd., Willesden Junction, N.W.10. [0061

SENIOR draughtsmen required. Aircraft experience desirable, but not essential.—Apply: Personnel Officer, Essex Aero, Ltd., Gravesend, Kent. [0068

BRITISH EUROPEAN AIRWAYS have vacancies for pilots with the minimum qualification of a current commercial pilot's licence:

(a) Pilots, aged 34 years and under, who will be engaged under the normal conditions of service, which includes membership of the pension scheme. Commencing salary on engagement will be within the range £600-£750 p.a., according to qualifications and experience.

(b) Pilots, aged 35 years and over, who will be engaged under special conditions on a temporary appointment for a period of service of two years, which may be extended up to a maximum period of four years. Commencing salary on engagement will be within the range £600-£850 p.a., according to qualifications and experience. Pilots serving on these appointments will not be eligible for entry into the pension scheme, but will receive a gratuity of £250 on the termination of the appointment for each completed year of service, subject to completing at least one full year's service.

REQUESTS for application forms, stating whether (a) or (b) appointments are being applied for, to be made by postcard to the Personnel Officer, Flight Operations Department, B.E.A., Keyline House, Ruislip, Middlesex. [0058

BROOKLANDS AVIATION, Ltd., have vacancies for ex-R.A.F. and R.N.A.S. airframe, engine fitters, electricians and woodworkers for servicing and repair of R.A.F. and R.N. aircraft.

GOOD conditions, interesting work and piecework bonus.

APPLY: No. 4 Site, Sywell Aerodrome, Northampton. [0308

APPLICATIONS are invited from design draughtsmen and stressmen; also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.

APPLICATIONS should state full particulars of experience and qualifications and should be addressed to The Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middx. [0075

OPPORTUNITIES exist in the gas turbine department of an East Midlands firm for a few draughtsmen who have passed Ordinary National Certificate. Work of an interesting nature on industrial gas turbines.

APPLICATIONS, stating age, experience, salary required to Box 0685.

INSPECTORS required on South Coast for aircraft sheet metal work and fuselage construction.—Write, stating age, if married, salary expected, and full details of experience, to Box 0586. [0590

LIMITED vacancies exist for draughtsmen of all grades. Applicants should state in writing, age, experience and qualifications to Personnel Officer, Westland Aircraft, Ltd., Yeovil, Somerset. [0021

YOUNG draughtsmen, 21 to 25 years, required for technical and development projects.—Apply: Technical Department, H. M. Hobson, Ltd., Fordhouses, Wolverhampton. [0016

ENGLISH ELECTRIC invite applications from all grades of draughtsmen to work on an interesting new project in the Acton, London, aircraft drawing office. These positions are permanent and pensionable. Those wishing to apply should write, quoting ref. 140A, to Central Personnel Services, English Electric Co., Ltd., 24-30, Gillingham St., London, S.W.1. [0081

SITUATIONS VACANT

JIG and tool draughtsmen required, fully experienced.—Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds, stating age, experience and salary required. [0593]

SENIOR jig and tool draughtsmen required for work on interesting and varied projects. Aircraft experience essential.—Full details and experience in writing to the Personnel Manager, Boulton Paul Aircraft, Ltd., Pendeford, Wolverhampton. [6041]

DRAUGHTSMEN with good aeronautical (or mechanical) experience, and stressmen with aeronautical experience required for varied, interesting work.—Portsmouth Aviation Developments, The Airport, Portsmouth [6552]

SCOTTISH AIRLINES require at once first officers and radio officers; DC-3 experience an advantage.—Write, stating full details of licences and experience, to Personnel Manager, Scottish Airlines, Prestwick Airport, Ayrshire. [6068]

AIRSPEED, Ltd., Christchurch, have vacancies for both aerodynamicists, preferably with experience of performance and/or stability and control. Superannuation scheme; hostel accommodation available; flying club in district. [6026]

AIRSPEED, Ltd., Christchurch, have vacancies for aircraft draughtsmen with radio installation experience.—Particulars in writing, stating training, past experience, and salary required, to Staff Superintendent, Airspeed, Ltd., Christchurch, Hampshire. [6057]

AIRCRAFT estimator required; good all-round experience and ability to work from drawings essential.—Applications in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [6092]

MECHANICAL, structural or general engineering draughtsman wanted for aircraft work; previous aircraft experience not essential; pension and life assurance scheme.—Apply: Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [0565]

HANDLEY PAGE, Ltd., have a vacancy for a technical illustrator with previous experience in aircraft work. —Write, stating age and full details of experience, to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [6003]

EXPERIENCED male technical illustrator and several experienced tracers required; must be neat and quick. —Apply in writing, stating age, experience and salary required, to the Chief Designer, Auster Aircraft, Ltd., Rearsby Aerodrome, Leics. [6005]

SPARES compilers of various grades, preferably with a knowledge of Ministry procedure. Also technical clerks for spares office.—Apply, giving details of age, experience, etc., to Personnel Officer, Westland Aircraft, Ltd., Yeovil, Somerset. [6020]

TECHNICAL assistant required for department engaged in development work on sheet metal assemblies, etc., principally required for gas turbines. National Certificate standard necessary. Apply, stating age and experience.—Box 0462. [0038]

APPLICATIONS are invited from senior draughtsmen to design internal combustion engine test plant for a well-known engineering firm in London.—Write, giving particulars of age, qualifications and experience, and quoting ref. ACD., to Box 0522. [0051]

DRAUGHTSMEN will find interesting work on aircraft undercarriages and hydraulic components with progressive company.—Apply in writing, stating age, qualifications, details of experience and salary required, to the Chief Draughtsman, British Messier, Ltd., Cheltenham Road East, Gloucester. [6046]

BROOKLANDS AVIATION, Ltd., have vacancies for ex-R.A.F. and R.N.A.S. Airframe engine fitters, electricians and woodworkers for servicing and repair of R.A.F. and R.N. aircraft. Good conditions, interesting work and piecework bonus.—Apply: No. 4 Site, Sywell Aerodrome, Northampton. [6060]

TECHNICAL assistants for t.c. engine performance, estimation and analysis of test results required by well-known engineering company in the London area. Practical experience and National Certificate are essential qualifications.—Write, giving full details and mentioning ref. DEE., to Box 0521. [6050]

TECHNICAL illustrators, artists or draughtsmen; fully capable of making perspective drawings of aircraft parts, systems, etc., in line for reproduction. Familiarity with engineering drawings is essential.—Write in writing to Personnel Manager, The Fairey Aviation Co., Ltd., Hayes, Middx. [6053]

RESEARCH engineer with university degree and experience of aero elastic problems required for research work on supersonic project. Senior staff appointment; house available.—Write, giving full details of experience, age, qualifications and salary required (quoting reference J.K.), to Box 0494. [6040]

THE DE HAVILLAND AIRCRAFT Co., Hatfield, Herts., invite applications to fill vacancies for jig and tool draughtsmen with experience of aircraft tooling, and good general engineering draughtsmen.—Apply, giving full details of age and past experience, to the Personnel Manager. [6045]

STRESS calculator. Experienced man required by aircraft engineers in Midlands. Must hold Higher National Certificate or equivalent qualifications. Excellent prospects for keen and competent man.—State fully details of experience and qualifications, age and salary required, to Box 0465. [6015]

TEST engineers required for development work on aircraft hydraulic systems. Previous experience essential. Age 21-35.—Apply in writing, stating age, experience and salary required, to H. R. Sewell, Chief Test Engineer, British Messier, Ltd., Cheltenham Road East, Gloucester. [5697]

THE DE HAVILLAND AIRCRAFT Co., Ltd., have vacancies for senior design and intermediate draughtsmen (preferably with aircraft experience) in their Hatfield and London (Regent Street) offices.—Applications, stating age, experience and salary required, to Chief Draughtsman, de Havilland Aircraft Co., Ltd., Hatfield, Herts. [5919

HANDLEY PAGE, Ltd., have a vacancy for a technical author for work in connection with the preparation of maintenance manuals, pilots notes, technical specifications, etc. Previous experience of this type of work preferable.—Write, stating age and full details of experience, to: Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [5979]

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SENIOR aircraft estimators required. Write, stating experience and qualifications, to Employment Manager, Vickers-Armstrongs, Ltd., (Aircraft Section), Weybridge. [6093]

EXPERIENCED senior draughtsmen and stressmen required for interesting new work. Applicants should hold the Higher National Certificate in engineering. Junior weight estimator also required.—Applicants for all posts should apply in writing, stating age, experience and salary expected, to the Chief Designer, Auster Aircraft, Ltd., Rearsby, Leics. [6061]

APPLICATIONS are invited from senior and intermediate design draughtsmen; experience of aero engine design desirable but not essential.—Please write, stating age and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0049]

DOWTY EQUIPMENT, Ltd., Aircraft Hydraulic Engineers, Arle Court, Cheltenham, require design draughtsmen, preferably with some knowledge of hydraulic and landing gear components for aircraft.—Write, Personnel Manager, giving details of training and experience and mentioning age and salary range. [6033]

HANDLEY PAGE (READING), Ltd., have vacancies in their design office for stressmen who should have at least two years' experience and with qualifications up to A.F.R., Ae.S. or B.Sc. standard; these vacancies carry excellent prospects for the right men.—Send full particulars to the Personnel Officer, Handley Page (Reading), Ltd., The Aerodrome, Woodley, Reading. [0074]

SENIOR aerodynamicists required for work on high-performance aircraft; applicants should have an engineering degree and experience in design of controls, performance calculations and estimation of aerodynamic loads.—Write, giving particulars of age, experience and salary required, to Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [0566]

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BRITISH OVERSEAS AIRWAYS Corporation offer opportunities of work on modern airliners to the following tradesmen: electricians, instrument mechanics and radio mechanics, sheet metal workers, engine and airframe fitters experienced in the maintenance or overhaul of aircraft and/or components. Rates of pay, 2/4 per hour, plus 4½d. per hour provisional bonus. Attracting proficiency pay up to 3d. per hour, five-day, 44-hour week; possible shift work. Good pension, sick pay and holiday facilities.—Write or call, Staff Manager, Hut 29, London Airport, Feltham, Middlesex. [0800]

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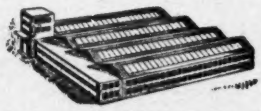

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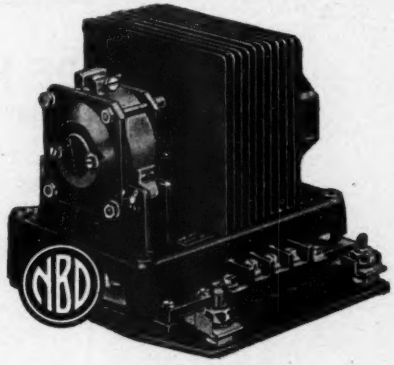

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